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BOOK REVIEW

Determinants of Nominal Exchange Rate of Pak-Rupee for US Dollar

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Abstract: In this paper determinants of nominal exchange rate are tested using quarterly data of more than twenty years on Pak-rupee exchange rate and other relevant variables. To estimate coefficients of independent variables, first OLS method is applied and then to take care of endogeneity problem between exchange rate and some of its determinants Generalized Method of Moments (GMM) is applied. The results show that both endogenous and policy variables in domestic and foreign countries affect nominal exchange rate. Overall, policy variables seem to be more important determinants than the endogenous variables and GMM estimates appear to be more robust than the OLS estimates.

Keywords: Nominal Exchange Rate, Least Squares, GMM
JEL Classification: C22, C51, F31

1. Introduction

Most of the studies that analyze Balance of Payments situation of a country focus on real exchange rate rather than on nominal, probably for two main reasons. One is that it is the real exchange rate of a country that indicates its productive efficiency and is, thus, helpful to infer the direction of trade-flow between two countries. For example, an increase in nominal exchange rate that means depreciation of local currency does not necessarily imply an increase in production efficiency of domestic economy.[1] However, if the increase in nominal exchange rate is accompanied by an increase in real exchange rate that happens to occur when the increase in nominal exchange rate is greater than the decrease in the relative foreign prices, then trade balance of the country improves

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[1] We have taken nominal exchange rate as the units of domestic currency per unit of foreign currency. In this case, an increase in its value implies depreciation of domestic currency, while a decrease in its value implies appreciation of domestic currency. Conversely, many researchers define nominal exchange rate as foreign currency per unit of domestic currency. In that case, an increase in its value implies appreciation of domestic currency, while a decrease in its value implies depreciation of domestic currency.

provided that trade between two countries is free from all restrictions.[2] In many developing countries, where inflation is rampant and foreign exchange markets are not so developed or exchange rate is controlled by authorities, a marked depreciation in nominal exchange rate is usually accompanied by a greater decrease in relative prices leaving the real exchange rate appreciated. Consequently, balance of trade worsens even though common people, looking at the depreciation of nominal exchange rate, expect it to improve.

The other reason is imbued from the theory of Purchasing Power Parity (PPP), which implicitly assumes that changes in the rate of relative prices are autonomous and changes in exchange rate, whether nominal or real, are accommodating. That is, if nominal exchange rate is fixed then real exchange rate changes in response to price changes and if nominal exchange rate is flexible, it itself changes such that real exchange rate remains more or less constant. This view treats a foreign currency just like Quantity Theory of Money treats local currency; it is held basically for transaction purposes and not as an asset held for its own sake. That is why supporters of floating exchange rate system, particularly Freidman (1953) and Meade (1955), strongly believed that under floating exchange rate system, speculation in foreign exchange markets would not be destabilizing in the long run.

However, to the disappointment of supporters of floating exchange rate system, variability in nominal exchange rates between major trading partners like United States, Germany and Japan has been far greater than that in their relative prices since the start of floating exchange rate system in 1973. But, surprisingly enough, extreme volatility in nominal exchange rate has not done much harm to world trade as feared by supporters of fixed exchange rate system (Krugman, 2004). Rather, it has been noted that recently manufacturing firms have been adjusting prices of their exports in territories of major trading partners in response to changes in respective nominal exchange rates. Their objective of doing so is obvious: to maintain market share and competitiveness in world markets by compromising on profit margins in the short run.

[2] Real exchange rate is equal to nominal exchange rate adjusted for foreign and domestic price levels. More detail is given later in the paper.

This apparent turn of causality from nominal exchange rate to relative prices due to globalization of capital and financial markets warrants shift of focus from real to nominal exchange rate as well. To put it differently, currently capital account balance in Balance of Payments record of a country is almost as much autonomous as is current account balance. Therefore, if the objective of a study is to analyze overall Balance of Payments situation of the country rather than only its balance of trade situation, then it should better focus on nominal exchange rate.

Nevertheless, in spite of the importance that nominal exchange rates have attained in recent years, the issue of nominal exchange rate determination remained in murky state as the attempts to empirically analyze the forces behind its fluctuation have remained unsatisfactory, particularly for developing countries like Pakistan. Empirical work on exchange rates in Pakistan is mainly focused on real exchange rates or real effective exchange rates (Afridi, 1995; Afridi and Siddiqui, 1994; Burney and Akhtar, 1992; Chishti and Hasan, 1993; Khan, 1986b; Siddiqui *et al.* 1996). The work on nominal exchange rates is either altogether scant or is confined only to PPP theory or other PPP- biased theories (see Ahmad and Ali, 1999; Ahmad and Khan, 2002; Ahmed, 1992; Bhatti, 1996, 1997, 2001). So there is a great need to focus on nominal exchange rate. This study is, therefore, a step forward in this direction. It identifies a number of possible determinants of nominal exchange rate and then empirically tests their expected relationships with nominal exchange rate.

This study is planned as follows: In Section 2, a brief history of exchange rate system of Pakistan is presented. An analytical framework is developed in Section 3. Empirical results are reported in Section 4. Concluding remarks with policy implications are summarized in the final section of this paper.

2. Exchange rate system in Pakistan

Real exchange rate (RER_t), for two equal trading partners, is defined as nominal exchange rate (NER_t) adjusted for foreign (P_t^*) and domestic price (P_t) levels i.e. $RER_t = NER_t \left(P_t^* / P_t\right)$. However, for a small open economy like Pakistan that is too small to affect prices of its tradables in

the world market, it is defined as nominal exchange rate adjusted for world prices of tradables (P_t^{T*}) to domestic price of non-tradables (P_t^N) i.e. $RER_t = NER_t\left(P_t^{T*}/P_t^N\right) = NER_t * RP_t$, where RP_t denotes relative price levels $\left(P_t^{T*}/P_t^N\right)$. The latter measure of real exchange rate is preferred over the former because its equilibrium value implies simultaneous equilibrium in external and internal (i.e. nontradables) sectors of the small economy (Edwards, 1988a).[3] However, for convenience and in line with Harberger (1986) we have proxied for world price of tradables with wholesale price index of US (WPI_t^*) and domestic price of nontradables by consumer price index of Pakistan (CPI_t). Thus, the real exchange rate used in this study is $RER_t = NER_t\left(WPI_t^*/CPI_t\right)$.

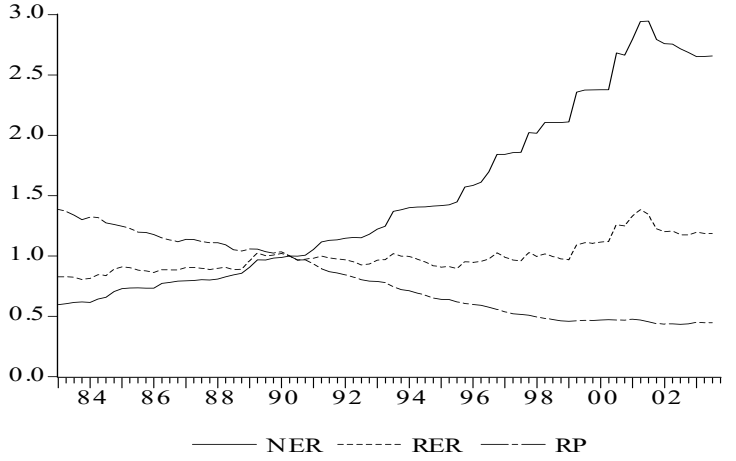
Soon after its independence in 1948, Pakistan joined the ongoing adjustable peg system of exchange rates that is generally known as the Breton Woods System. Pakistan fixed parity of its currency against US dollar at Rs. 3.32 and revised it in 1955 to Rs. 4.78 in order to reduce its increasing Balance of Payments deficit.[4] The revised parity continued until the end of Breton Woods System in 1971. After the start of flexible exchange rate system among major industrialized countries of the world, Pakistan decided to keep its exchange rate fixed against US dollar fearing uncertainty in prices of tradables that might have jeopardized the growing potential of manufacturing sector that was still in its infancy at that time. However, Pakistan devalued its currency to Rs 9.9 per US dollar in 1973 to control its widening Balance of Payments deficit. Finally, in 1982 Pakistan decided to delink its currency with US dollar. Since then, Pak-rupee has been depreciating continuously until the turn of the 21st century. Since the unfortunate event of 9/11, Pak-rupee seems to have attained some stability around Rs. 60 per US dollar probably due to massive inflow of remittances from the expatriates in the West fearing a freeze on their bank accounts.

To have an idea of the direction and degree of change in the three closely related variables - nominal exchange rate, real exchange rate and the

[3] For more details see Dornbusch (1974, 1980) and Krueger (1982).
[4] All these figures are taken from various issues of *International Financial Statistics*.

relative price levels - their graphs are plotted in the same figure. Figure 1 shows that variability in nominal exchange rate has been the greatest, followed by the ratio of relative prices. Proportionately greater depreciation in nominal exchange rate that is not justified by decline in relative price ratio can be attributed partly to bulging debt servicing of foreign debt and to relatively unattractive performance of domestic financial and capital markets.

Figure 1: Indices of Pak-Rupee Nominal Exchange Rate, Real Exchange Rate and Relative Price Levels Relative to US Dollar (1983Q1 to 2004Q4)



Correlation Coefficients:

$r_{RER,NER}$	0.8962
$r_{NER,RP}$	-0.9884
$r_{RER,RP}$	-0.7436

The minimum variation in real exchange rate (at least until 1998) conforms with the theory of purchasing power parity to som e extent as decreased value of relative price level has been accompanied consistently by depreciation of local currency, leaving the real exchange rate more or less constant. High negative value of correlation coefficient between nominal exchange rate and relative price level (-0.98) vindicates this

argument. It is also noteworthy that nominal depreciation of local currency has been accompanied with depreciation of real exchange rate almost over the whole period, but the trend is more vivid after 1998. High positive value of correlation coefficient between nominal and real exchange rates (0.89) also validates this argument.[5] This upward trend and high volatility of real exchange rate after 1998 goes against the theory of purchasing power parity. In fact, depreciation of nominal exchange rate is so high that reduced value of relative price level is unable to offset its effect on real exchange rate. As a result, real exchange rate begins to depreciate along with the nominal one. It means that the phenomenon of moving nominal and real exchange rates in opposite direction has not been experimented in Pakistan. Finally, it is also evident that relative price level and real exchange rate remained highly inversely correlated, which is also validated by high negative value of correlation coefficient (-0.74).

3. Analytical Framework

In line with some important researches on this topic, the following eight variables, which include both policy and endogenous ones, are identified as possible determinants of nominal exchange rate. Each of these variables and the relevant theory that justifies its inclusion in the model are explained turn by turn.

$$\ln(NER_t) = \alpha_1 + \alpha_2 \ln(RP_t) + \alpha_3 \ln(TOT_t) + \alpha_4 \ln(TAXIT_t) + \alpha_5 \ln(FD_t) + \alpha_6 \ln(INF_t) + \alpha_7 \ln(FER_t) + \alpha_8 \ln(CAP_t) + \alpha_9 \ln(CRT_t) + \alpha_{10} \ln(NER_{t-1}) + \upsilon_t$$

Various variables are defined as follows:

NER_t = Nominal Exchange Rate of Pak-rupee against a US dollar

RP_t = Relative Prices of tradables to nontradables

TOT_t = Terms of Trade Index

$TAXIT_t$ = Taxes on International Trade

FD_t = Fiscal Deficit

[5] The figure also validate the findings of Edwards (1987) that countries with more variable rates of nominal devaluation also have more volatile real exchange rates.

INF_t = Net Capital Inflow
FER_t = Foreign Exchange Reserves
CAP_t = Capital Accumulation
CRT_t = Domestic Credit
NER_{t-1} = Lagged dependent variable
υ_t = Residual term

To find elasticities, we have taken all variables in natural log (denoted by ln) except net capital inflow and domestic credit creation because some of their values are negative. It is also assumed that υ_t is white noise stochastic term and that $\upsilon_t \sim N(0, \sigma^2)$.

Relative Price (RP_t), whether foreign to domestic in case of equal trading partners or tradables to nontradables in case of a small open economy like Pakistan, indicates productive efficiency of the two countries. For example, if interest rates and other financial and political conditions, which affect the demand for foreign currency as an asset, remain unchanged, an increase in relative price means that the domestic cost of production has decreased. Therefore, according to purchasing power parity, trade balance of domestic economy should improve; that, in turn, puts pressure on appreciation of domestic currency. It implies that nominal exchange rate is inversely related to relative price of tradables to nontradables (Lane, 1999).

Terms of Trade Index (TOT_t) effect measures the exchange rate of exports with imports and affects nominal exchange rate indirectly through its effect on relative price of tradables to nontradables. An improvement in terms of trade that could be either due to an increase in export prices or a decrease in import prices affects relative price of tradables to nontradables through substitution and income effects (Edwards and Wijnbergen, 1987; Lane, 1999). Income effect may be neutral for tradables and nontradables if they are normal goods, but substitution effect may not be known with certainty. Therefore, the total of substitution and income effects is theoretically impossible to know beforehand. However, the empirical evidence available so far suggests that terms of trade and relative price of

tradables to nontradables move in opposite direction. In other words, in a regime of fixed exchange rates, a worsening of terms of trade ends up with depreciation of equilibrium real exchange rate (Edwards, 1988a). It means that there should be positive relationship between nominal exchange rate and terms of trade.

Taxes, in context of international trade $(TAXIT_t)$, refer to import tariffs and export subsidies, but sometimes they also imply other restrictions like import quotas. The main objective of such taxes, mostly in developing countries that experience a balance of trade deficit, is to bolster net exports by giving subsidies to exporters and to limit imports by imposing tariffs and other restrictions on imports. Consequently, export prices to foreigners decrease and import prices to local people increase, leaving an uncertain impact on tradables that comprise both exports and imports (Connolly and Devereux, 1995; Edwards, 1989). However, an increase in import prices encourages demand for import substitutes that fall in the category of nontradables. But the same time, negative income impact of taxes reduces demand for nontradables. It means that although taxes possibly affect prices of all categories of goods, their overall impact on relative prices and thus, on nominal exchange rate cannot be known a priori (Edwards and Wijnbergen, 1987).

Fiscal Deficit (FD_t) affects nominal exchange rate through three different channels.[6] One, it affects relative prices of tradables to nontradables depending upon the main category of goods, tradables or nontradables, on which government spends its deficit. If government utilizes most of the funds to purchase nontradables, relative price of tradables to nontradables decreases and nominal exchange rate is expected to increase (Connolly and Devereux, 1995; Edwards, 1988b).[7] Otherwise, if government purchases mostly imported goods relative price of tradables to nontradables increases and nominal exchange rate is expected to decrease (Krugman, 2004). The other channel is that when budget deficit is

[6] Also see, among others, Abell (1990), Burney and Akhtar (1992) and, Connolly and Devereux (1995).

[7] However, if fiscal deficit is associated with greater public investment in nontradables, nominal exchange rate will decrease via trade surplus.

financed by domestic borrowing, interest rates in the country increase.[8] According to the theory of interest rate parity, an increase in interest rate induces capital inflow that results in appreciation of local currency. Similarly, appreciation of local currency is expected if government finances the budget deficit by external borrowing (Chishti and Hasan, 1993). Last, but not the least, budget deficit also affects expectations of market participants about sustainability of deficit. The more they believe that deficit would be unsustainable, the greater risk premium or interest rate they would require on government borrowing. Heightening of such expectations beyond a certain limit may inhibit required capital inflow in the country at any interest rate and may prove a starting point for a financial crisis. Thus, the effect of fiscal deficit on exchange rate is theoretically undetermined.

Capital inflow (INF_t), as discussed above, causes an immediate appreciation of local currency. However, if utilization of incoming capital is mostly for nontradables, relative price of tradables to nontradables decreases and, consequently, the initial appreciation of local currency is offset partially or completely (Edwards, 1988a, 1988b; Khan, 1986a; Mehta, 2000; Razin and Collins, 1997).

Foreign Exchange Reserves (FER_t) represent the stance of interventionary exchange rate policy. When capital inflow by private agents becomes highly volatile, nominal exchange rate fluctuates too much and too often. Therefore, almost all countries of the world that follow floating exchange rate system do not allow free floating in episodes of undue volatility. As soon as nominal exchange rate actually crosses or is believed to cross an announced or unannounced upper or lower limit, government steps into the foreign exchange market. For example, if nominal exchange rate is expected to appreciate beyond a pre-specified limit, government starts purchasing foreign currency or accommodating its foreign exchange reserves. However, such interventions are usually not publicized and are not necessarily continued until the reversal of the trend. Rather, they are discontinued after taking

[8] There are five different ways to finance budget deficits, that is (i) money creation via printing, (ii) internal borrowing, (iii) external borrowing, (iv) depletion of foreign exchange reserves, and (v) a combination of all these.

some air out of the balloon. Therefore, if it is hypothesized that government interventions in foreign exchange market are carried out mostly to release pressure, not to reverse the trend, the relationship between foreign exchange reserves and nominal exchange rate should be negative (Yagei, 2001).[9]

Capital Accumulation (CAP_t) represents production capacity and potential for economic growth and technological progress of a country. As capital accumulates, gross domestic product of the country increases excepting the events like Farmers' curse and immiserizing growth. The way relative price of tradables to nontradables responds to capital accumulation depends on whether capital accumulation takes place mostly in export industry or in industries of import substitutes and nontradables (Afridi, 1995; Edwards, 1988b). The response also depends upon income elasticities of these industries. Overall, the response of relative price and thus of nominal exchange rate to capital accumulation remains ambiguous beforehand.

Domestic Credit (CRT_t) is generally used to represent the stance of monetary policy, affects nominal exchange rate through its influence on nominal interest rates. According to the theory of interest rate parity, a decrease in domestic credit causes an increase in nominal interest rate, which in turn induces capital inflow and results in appreciation of local currency and vice versa. Moreover, decrease in domestic credit means low money supply, which results in low inflation and if PPP holds (in the long run) then exchange rate appreciates. It means that the relationship between nominal exchange rate and domestic credit should be positive.

4. Estimation and Results

To estimate our model the quarterly data is used for the period 1983 to 2004. Description of variables along with data sources has been given in Appendix A. We have applied Ordinary Least Squares (OLS) to estimate our regression equation. However, in order to control for the potential endogeneity of some of the explanatory variables, we have also applied Generalized Methods of Moments (GMM) estimation technique of

[9] Also see Hariharan (2000) and Jayaraj (2000).

Arellano (1993) and Arellano and Bond (1991). In our model, endogeneity problem is likely to arise with six variables: relative price, terms of trade, foreign exchange reserves, capital accumulation, fiscal deficit and domestic credit. Therefore, in GMM estimation we have taken lagged values of these six variables along with the current and lagged values of the (two) exogenous variables, namely, Taxes on International Trade and Net Capital Inflows as instruments.[10]

Table 1 presents estimation results by both methods. The second column presents the results of OLS estimation, while column 3 presents results of GMM estimation. A cursory view of these results shows that all estimated parameters have theoretically expected signs and most of them are statistically significant. High values of R^2 and adjusted R^2 indicate that the variation in Pak-rupee exchange rate explained by the regressions is quite robust. Also, the calculated values of Durbin h test indicate absence of autocorrelation in the data.

Regression coefficient of Relative Price (RP_t) has expected negative sign in both estimation methods and is statistically significant. Particularly, an increase in tradable prices relative to nontradable prices has led Pak-rupee to appreciate probably via Current Account improvements. These results are in accord with Ahmad and Khan (2002) and Engel (1999) that Purchasing Power Parity holds, at least partially, if appropriate price indexes are taken into account. However, the significance level of this variable is higher in GMM estimation than that in OLS estimation and the same holds for its estimated elasticity.

Terms of Trade Index (TOT_t) affects Pak-rupee exchange rate positively and significantly in both specifications. This result lends support to the fact that substitution effect of TOT has dominated its income effect as suggested by Edwards (1988b) and Lane (1999). In both specifications it

[10] To verify long-run relationship between dependent and independent variables, we have applied ADF unit-root tests. The results show that two variables, namely, Net Capital Inflows and Domestic Credit are stationary, while the remaining six variables are integrals of order one. It indicates that the estimate of nominal exchange rate equation can form a long-run relationship of nominal exchange rate with six of the eight explanatory variables, while the relationship with the two stationary variables is based on short-term variations in the latter.

is evident that if US terms of trade improve by one percentage point, then Pak-rupee depreciates by 0.44 percentage points against US dollar.

Table 1: Empirical Findings of Nominal Exchange Rate Determination Model: (1983Q1-2004Q4)

Variables	Estimation Technique	
	OLS Estimation	GMM Estimation
Constant	0.5497 (2.5443)*	0.7529 (3.5255)*
Relative Price Level (FRP_t)	-0.1570 (-2.4305)*	-0.2350 (-3.5246)*
Terms of Trade Index (TOT_t)	0.4452 (2.7968)*	0.4473 (1.9902)**
Taxes on International Trade ($TAXIT_t$)	-0.0556 (-2.5168)*	-0.0549 (-3.4106)*
Fiscal Deficit (FD_t)	-0.0335 (-1.3042)	-0.0494 (-2.0154)*
Net Capital Inflow (INF_t)	0.3686 (3.1272)*	0.2106 (2.2647)*
Foreign Exchange Reserves (FER_t)	-0.0173 (-2.8300)*	-0.0252 (-5.1014)*
Capital Accumulation (CAP_t)	0.0897 (1.3881)	0.1119 (1.4366)
Domestic Credit (CRT_t)	0.1442 (1.3839)	0.3357 (2.0430)*
Lagged Exchange Rate (NER_{t-1})	0.8233 (13.7281)*	0.7645 (13.2492)*
R^2	0.9978	0.9976
Adjusted- R^2	0.9975	0.9973
Durbin *h* test	-0.0652	0.6197
F-stat	3582.6820	---
Prob-F	0.0000	---

Note: Values in parentheses denote underlying student-*t* values. The *t* statistics significant at 5 % and 10 % levels of significance are indicated by * and **, respectively.

Trade restriction variable ($TAXIT_t$) has shown negative and significant effect on Pak-rupee exchange rate in both regression specifications. It indicates that increased taxes on international trade have led Pak-rupee to appreciate through current account improvements. Like other variables, the significance of this variable is slightly higher in GMM estimation. Estimated coefficients reveal that if trade taxes are increased by one per cent, Pak-rupee appreciates by 0.05 percentage points against US dollar. Our findings on trade restrictions are in contradiction with the findings of Lane (1999) who points out that trade restrictions should cause a depreciation of domestic currency as he found that inflation was higher in economies, which imposed trade restrictions (also see Romer, 1993; Lane, 1997).

Coefficient of Fiscal Deficit (FD_t) bears a negative sign in both specifications. It indicates that deficit financing in Pakistan has led to appreciation of Pak-rupee because to finance its deficit government has to borrow from internal and external sources. Consequently, interest rates moved up that attracted net capital inflow leading to appreciation of local currency. Further, fiscal deficit financing through external borrowing has released the demand pressure in the foreign exchange market, which resulted in exchange rate appreciation. However, this variable is significant only in GMM estimation and is not significant in OLS estimation. This reduces its importance to some extent.

Net Capital Inflow (INF_t) has positive and significant effect on Pak-rupee exchange rate in both specifications. The result shows that an increase in capital inflow has resulted in depreciation of Pak-rupee against US dollar. It implies that private capital inflows in Pakistan push up the prices of nontradables, making the relative price of tradables to nontradables decrease. As a result, Trade Balance worsens more than the initial improvement in Capital Account Balance and the overall Balance of Payments deteriorate and nominal exchange rates depreciate.

Accumulation of foreign exchange reserves (FER_t) has led to significant appreciation of Pak-rupee against US dollar in both specifications. The level of significance and magnitude of estimated elasticity of this variable is higher in GMM estimation than that in OLS estimation. However, the

magnitude of elasticities of this variable in both regressions is smaller than magnitude of all other elasticities and coefficients. It indicates that the effect of foreign exchange reserves on Pak-rupee exchange rate is negligible.

The results further show that Capital Accumulation (CAP_t) has affected Pak-rupee exchange rate positively but insignificantly in both specifications. The positive sign of this variable indicates that enhanced production capacity of the country due to capital accumulation probably pushes up the relative price of nontradables because of the dominance of income effect over the substitution effect. Therefore, an increase in capital accumulation has been accompanied by a decrease in the relative price of tradables to nontradables that has resulted in depreciation of nominal exchange rate as implied by purchasing power parity.

Increased Domestic Credit (CRT_t) has caused Pak-rupee to depreciate. One reason is that domestic credit creation has inflationary consequences, which adversely affect the Trade Balance, leading to the depreciation of Pak-rupee against US dollar. The other reason is that an increase in domestic credit lowers interest rates and encourages capital outflow that also results in depreciation of Pak-rupee. Nevertheless, this variable with an estimated coefficient of 0.33 is significant only in GMM estimation.[11] Finally, the lagged dependent variable appears highly significant with positive value in both regression specifications as expected. Also, the high elasticity of this variable suggests that, *ceteris paribus*, exchange rate converges rather slowly to its long run equilibrium.

Tables 2 and 3 provide a comparison of our study with some earlier studies conducted for Pakistan. These studies include Afridi (1995), Siddiqui *et al.* (1996), Farooq (2002), Hussain (2003) and Ali (2003). Our study comprises bilateral nominal exchange rates so a direct comparison is not possible as all these studies take into account bilateral real and real

[11] Note that both the fiscal deficit and domestic credit variables appeared insignificant in least squares estimations. One might argue that it might be due to high correlation between these two variables. However, the correlation between the two variables was quite low (0.17), rescinding this argument.

effective exchange rates. However, a rough comparison has been presented.

A perusal of Table 3 reveals that all regressions have satisfactory explanatory powers and there is no autocorrelation problem. For Terms of Trade, our findings negate those of Afridi (1995) and Siddiqui *et al.,* (1996) that Terms of Trade have no significant effect on the real exchange rate of Pakistan. However, it reinforces Hussain's (2003) findings that Terms of Trade significantly affect exchange rates in Pakistan. For trade restrictions, our findings are in accordance with those of Farooq (2002), Hussain (2003) and Ali (2003) and are against the findings of Siddiqui *et al*., (1996).[12] For Net Capital Inflow, our results contradict the findings of all studies as they claim a negative significant effect on real exchange rate since most of the expenditure will fall on domestic non-traded goods. As far as Capital Accumulation is concerned, all studies find insignificant impacts of this variable on exchange rate. For Domestic Credit Creation, our results support the findings of Farooq (2002), but are against the findings of Afridi (1995) and Siddiqui *et al.,* (1996). In turn, for Fiscal Deficit, our results support the findings of Afridi (1995) and oppose the findings of Farooq (2002).

Table 2: Comparison with Other Studies (General Comparison)

Studies	Nature of Exchange Rate	Nature of the Data	Period	Estimation Technique(s)	Model Specification
Afridi (1995)	Real Exchange Rate	Annual	1960-90	OLS	Linear Model
Siddiqui *et al.,* (1996)	Real Exchange Rate	Annual	1960-94	OLS & 2SLS	Linear Model
Farooq (2002)	Real Effective Exchange Rate	Annual	1971-2000	OLS	Log Linear Model
Hussain (2003)	Real Exchange Rate	Annual	1950-51 – 2000-01	Maximum Likelihood	Log Model
Ali (2003)	Real Exchange Rate	Annual	1947-48 – 2000-01	OLS	Log Linear Model
Present Study	Nominal Exchange Rate	Quarterly	1983Q1-2004Q4	OLS & GMM	Log Linear Model

[12] Results of different studies may differ since the different studies have applied different proxies to measure a particular variable.

Table 3: Comparison with Other Studies (Statistical Comparison)

Variables	Afridi (1995)	Siddiqui *et al.*, (1996) OLS	Siddiqui *et al.*, (1996) 2SLS	Farooq (2002)	Hussain (2003)	Ali (2003)	Present Study OLS	Present Study GMM
Constant	3.950 (5.550)*	5.491 (6.940)*	4.471 (14.330)*	0.409 (3.973)*	15.400^	2.649 (2.010)*	0.549 (2.544)*	0.752 (3.525)*
Relative Price Level	---	---	---	---	---	---	-0.157 (-2.430)*	-0.235 (-3.524)*
Foreign/Domestic Terms of Trade	0.007 (0.790)	0.003© (0.030)	0.030 (1. 520)	---	-1.790© (-3.790)*	---	0.445 (2.796)*	0.447 (1.990)**
Technological Progress	-0.061 (-1.690)	-0.0005 (0.130)	-0.015 (6.560)*	---	---	---		
Trade Restriction/ Open-ness	---	-0.713© (7.600)*	-0.397© (5.820)*	-0.163 (-2.355)*	0.990© (2.190)*	0.944© (3.130)*	-0.055 (-2.516)*	-0.054 (-3.410)*
Net Capital Inflow	-0.245 (-2.100)*	-0.054 (2.220)*	-0.222 (8.010)*	-1.368 (-6.715)*	---	-0.943 (-2.520)*	0.368 (3.127)*	0.210 (2.264)*
Capital Accumulation	0.140 (1.420)	---	---	---	---	---	0.089 (1.388)	0.111 (1.436)
Domestic Credit Creation	-0.062 (-3.620)*	-0.007 (5.880)*	-0.004 (7.510)*	0.278 (3.027)*	---	---	0.144 (1.383)	0.335 (2.043)*
Government Consumption	0.423 (4.790)*	0.656 (6.590)*	0.697 (22.540)*	---	-1.550 (-3.280)*	---		
Exchange Rate Regime Dummy	0.303 (1.980)*	---	---	---	---	---		
Fiscal Deficit	-0.023 (-2.870)*	---	---	0.337 (3.964)*	---	---	-0.033 (-1.304)	-0.049 (-2.015)*
Nominal Devaluations	0.080 (6.420)*	---	---	0.702 (11.510)*	---	0.49hay2 (5.230)*		
GDP Growth Rate	---	---	---	---	---	-0.173 (-1.880)**		
Debt Service/ Foreign Debt	---	---	---	---	1.220© (2.530)*	0.193 (2.170)*		
Foreign Exchange Reserves							-0.017 (-2.830)*	-0.025 (-5.101)*
Lagged Dependent Variable	0.751 (7.850)*	---	---	0.801 (10.461)*	---	1.416 (1.740)**	0.823 (13.728)*	0.764 (13.249)*
R^2	0.990	0.951	0.997	0.991	---	0.930	0.997	0.997
DW/ Durbin *h* Test	1.85	---	---	2.315	---	2.11	-0.065©	0.619©
F-Statistics	---	87.300	1738.780	300.760	---	---	3582.682	---

Notes: Values in parentheses denote underlying student-*t* values. The *t* statistics significant at 5 % and 10 % levels of significance are indicated by * and **, respectively. ^ indicates that *t*-value is not available. © indicates the alternative of the first variable.

5. Conclusion

In contrast with previous studies on the subject, this study focuses on nominal exchange rates rather than real ones, accounting for more variability in the former than in the latter and in comparison to relative price of tradables to nontradables. The study also keeps in view the latest behavior of major exporting firms that adjust prices of their exports in response to changes in the nominal exchange rate- probably to keep prices of their products stable in overseas markets.

The paper has empirically examined the main determinants of bilateral nominal exchange rate of Pak-rupee against US dollar using quarterly data for the period 1983 to 2004. For this purpose, a dynamic model of nominal exchange rate determination is estimated using Ordinary Least Squares and GMM estimation techniques. The results show that Pak-rupee nominal exchange rate depends upon a number of endogenous and policy variables. Specifically, fluctuations in nominal exchange rates can be explained by relative inflation at home and abroad, fiscal and monetary policies, terms of trade, capital formation, trade restrictions, capital mobility and decisions of respective governments to intervene in foreign exchange markets. To summarize, our findings are in consonance with those of Connolly and Devereus (1995), Edwards (1988a) and Lane (1999). Furthermore, as compared to least squares, GMM estimations provided robust results. Therefore, this model can be used for both prediction and analytical understanding. It can also be used for critical evaluation of various policy options.

Negative coefficient of Budget Deficit shows that under the condition of (almost) free capital mobility, expansionary fiscal policy is not very fruitful because appreciation of local currency due to budget deficit crowds out the increased net exports to a great extent. On the other hand, positive coefficient of Domestic Credit implies effectiveness of monetary policy, provided that it does not ignite inflationary expectations. Furthermore, significance of Foreign Exchange Reserves implies that timely intervention in foreign exchange markets may also be useful to counter speculative attacks on local currency. This result is consistent with that of Siddiqui *et al.,* (1996) that suitable monetary policy along

with a transitory intervention in foreign exchange markets may be quite effective for maintaining stability of nominal exchange rates.

In practice, the expansionary monetary policy in Pakistan has played havoc by inducing outflow from capital markets. Consequently, nominal exchange rate has depreciated relatively more than the decrease in relative price almost throughout the period of study. This uninterrupted slide of Pak-rupee has raised the burden of foreign debt and probably nourished unwarranted expectations against Pak-rupee, though expectations of inflation inertia could partially take care of this perverse phenomenon. The policy recommendation is the one propagated by Mundell (2000), that is, price stability be achieved through monetary discipline and economic stimulation through tax-cuts and regulatory improvements, but not through monetary expansion.

References

Abell, J. D. 1990. "The role of budget deficits during the rise in the dollar exchange rate from 1979-85" *Southern Economic Journal* 57(1): 66-74.

Afridi, U. 1995. "Determining real exchange rates" *The Pakistan Development Review* 34: 263-276.

Afridi, U. A. and R. Siddiqui 1994. "Framework for deriving real exchange rates" *The Pakistan Development Review* 33: 1099-1112.

Ahmad, E. and S. A. Ali 1999. "Exchange rate and inflation dynamics" *The Pakistan Development Review* 38: 235-251.

Ahmad, E. and F. N. Khan 2002. "Short run dynamics in purchasing power parity: A case of selected Asian countries" *Middle East Business and Economic Review* 14(2): 28-40.

Ahmed, M. 1992. "Pakistan's exchange rate policy: An econometric investigation" *The Pakistan Development Review* 31: 49-74.

Ali, A. 2003. "Exports and misalignment of real exchange rate: A case of Pakistan" Unpublished M.Phil. Dissertation, Department of Economics, Quaid-i-Azam University, Islamabad, Pakistan.

Arellano, M. 1993. "On testing of correlation effects with panel data" *Journal of Econometrics* 59 (1): 87-97.

Arellano, M. and S. Bond 1991. "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations" *Review of Economic Studies* 58: 277-297.

Bhatti, R. H. 1996. "A correct test of the purchasing power parity: The case of Pak Rupee exchange rates" *The Pakistan Development Review* 35: 671-682.

Bhatti, R. H. 1997. "Do expectations play any role in determining Pak Rupee exchange rates?" *The Pakistan Development Review* 36(3): 263-273.

Bhatti, R. H. 2001. "Determining Pak Rupee exchange rates vis-à-vis six currencies of the industrial world: Some evidence based on the traditional flow model" *The Pakistan Development Review* 40: 885-897.

Burney, N. A. and N. Akhtar 1992. "Government budget deficits and exchange rate determination: Evidence from Pakistan" *The Pakistan Development Review* Vol. II, 31: 871-882.

Chishti, S. and M. A. Hasan 1993. "What determines the behaviour of real exchange rate in Pakistan?" *The Pakistan Development Review* 32: 1015-1029.

Connolly, M. and J.Devereux 1995. The equilibrium real exchange rate: Theory and evidence for Latin America. In: J. L. Stein, P. R. Allen and Associates, eds. *Fundamental determinants of exchange rates.* 154-181. New York: Oxford University Press.

Dornbusch, R. 1974. "Tariffs and nontraded goods" *Journal of International Economics* 4: 117-185.

Dornbusch, R. 1980. "Two notes on exchange rate rules and on real value of external debt" Working Paper No. 1980/567. Cambridge, MA: NBER.

Edwards, S. 1987. "Real exchange rate variability: An empirical analysis of the developing countries' case" *International Economic Journal* 1(1): 91-106.

Edwards, S. 1988a. "Exchange rate misalignment in developing countries" Baltimore and London: Johns Hopkins University Press.

Edwards, S. 1988b. "The real and monetary determinants of real exchange rate behavior: Theory and evidence from developing countries" *Journal of Development Economics* 29: 311-341.

Edwards, S. 1989. "Tariffs, capital controls, and equilibrium real exchange rates" *Canadian Journal of Economics* 22(1): 79-92.

Edwards, S. and S. V. Wijnbergen 1987. "Tariffs, the real exchange rate and the terms of trade: On two popular propositions in international economics" *Oxford Economic Papers* 39: 458-464.

Engel, C. 1999. "Accounting for U.S. real exchange rate changes" *Journal of Political Economy* 107(3): 507-538.

Farooq, S. 2002. "The real effective exchange rate determination and its impact on trade flows: A case study of Pakistan" Unpublished M. Phil. Dissertation, Department of Economics, Quaid-i-Azam University, Islamabad, Pakistan.

Friedman, M. 1953. The case for flexible exchange rates. In: M. Friedman, eds. *Essays in positive economics.* 157-203. Chicago: University of Chicago Press.

Harberger, A. 1986. Economic adjustment and real exchange rate. In: S. Edwards and L. Ahamed, eds. *Economic adjustment and exchange rates in developing countries.* Chicago: University of Chicago Press.

Hariharan, S. V. 2000. Exchange rate behaviour and its determinants in India and Sri Lanka. In A. Ghosh and R. Raman, eds. *Exchange rate behaviour in developing countries.* 74-83. New Delhi: Deep and Deep Publications Pvt. Ltd.

Hussain, A. 2003. "*Exchange rate misalignment and economic growth: With reference to Pakistan"* Unpublished M.Phil. Dissertation, Department of Economics, Quaid-i-Azam University, Islamabad, Pakistan.

Jayaraj, S. 2000. The determinants of the external value of Rupee. In: A. Ghosh and R. Raman, eds. *Exchange rate behaviour in developing countries.* 21-35. New Delhi: Deep and Deep Publications Pvt. Ltd.

Khan, M. S. 1986a. "Developing country exchange rate policy responses to exogenous shocks" *American Economic Review* 76(2): 84-87.

Khan, M. S. 1986b. "Exchange rate policies of developing countries in the context of external shocks" *The Pakistan Development Review* 25: 403-427.

Krueger, A. O. 1982. "Analyzing disequilibrium exchange-rate systems in developing countries" *World Development* 10 (12): 1059-1068.

Krugman, P. 2004. "Exchange rates" *Concise Encyclopedia of Economics, Library of Economics and Liberty* from http://www.econlib.org

Lane, P. R. 1997. "Inflation in open economies" *Journal of International Economics* 42: 327-347.

Lane, P. R. 1999. "What determines the nominal exchange rate? Some cross-sectional evidence" *The Canadian Journal of Economics* 32(1): 118-138.

Meade, J. E. 1955. "The case for variable exchange rates" *Three Banks Review* 3-27.

Mehta, A. S. 2000. Theories of exchange rate determination: Some evidence from India. In: A. Ghosh and R. Raman, eds. *Exchange rate behaviour in developing countries.* 26-73. New Delhi: Deep and Deep Publications Pvt. Ltd.

Mundell, R. A. 2000. "A reconsideration of the twentieth century" *American Economic Review* 90(3): 327-340.

Razin, O. and S. M. Collins 1997. "Real exchange rate misalignment and growth" Working Paper No. 1997/6174. Cambridge, MA: NBER.

Romer, D. 1993. "Openness and inflation" *Quarterly Journal of Economics* 108 (4): 869-903.

Siddiqui, R., U. Afridi and Z. Mahmood 1996. "Exchange rate determination in Pakistan: A simultaneous equation model" *Pakistan Development Review* 35(4): 683-692.

Yagei, F. 2001. "Choice of exchange rate regimes for developing countries" Africa Region Working Paper Series No. 16. Washington, DC: The World Bank.

Appendix A

Variable Description and Data Sources

Nominal Exchange Rate (NER_t): Nominal exchange rate has been defined as domestic currency per unit of foreign currency, that is, Pak-rupee per US dollar. Raw data has been taken from multiple issues of International Financial Corporation and International Financial Statistics.

Relative Price Level (RP_t): This variable is constructed as the ratio of wholesale price index of US to consumer price index of Pakistan. The data has been collected from International Financial Corporation and International Financial Statistics (various issues).

Terms of Trade (TOT_t): It has been described as US price of exports to US price of imports. The data for this variable was taken from International Financial Corporation and International Financial Statistics (various issues).

Taxes on International Trade ($TAXIT_t$): This variable has been developed as the ratio of taxes on foreign trade to total trade. Data on foreign trade taxes has been collected from the Economic Survey of the Government of Pakistan (various issues). The data on total trade was taken from International Financial Corporation and International Financial Statistic (various issues).

Fiscal Deficit (FD_t): Fiscal deficit has been taken as a ratio to nominal GDP. The data source was International Financial Corporation and International Financial Statistics (various issues).

Capital Inflows (INF_t): The net capital inflow variable has been defined as the ratio of the capital account surplus to nominal GDP. The raw data was taken from International Financial Corporation and International Financial Statistics (various issues).

Foreign Exchange Reserves (FER_t): Foreign exchange reserves have been calculated in real terms by deflating foreign exchange reserves with GDP deflator. The data source was International Financial Corporation and International Financial Statistics (various issues).

Capital Accumulation (CAP_t): This variable has been constructed by taking the ratio of gross fixed capital formation to nominal GDP. The data was collected from International Financial Corporation and International Financial Statistics (various issues).

Domestic Credit (CRT_t): This variable has been defined as the difference between the rate of growth of domestic credit and the rate of growth of nominal GDP. The crude data was collected from International Financial Corporation and International Financial Statistics (various issues).

Economics of Change in Temporal Allocation of Irrigation Water: A Case of Punjab Canal Closure

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Abstract: A linear programming model was developed in canal command area of the central Punjab through a farm survey of 120 farmers. The crop budgets were developed for representative farms, namely, small, medium, head and tail. The intent of the paper was to show that canal closure in critical months adversely affects farm revenue. In the Indus Basin area, water delivery is supply-driven and allocative rules are hard and fast for water delivery and canal closures. The analysis shows that farm net revenue is adversely affected if canals are closed during the critical growth period of crops, especially wheat. The model results show that April is the month when farm revenue and water productivity are higher as compared to January's canal closure. The analysis leads us to conclude that canal management should make allocative rules flexible and farmer friendly.

Keywords*:* Indus Basin, Irrigation Intensity, Canal Closure, Farm Net Revenue, Water Productivity
JEL Classification*:* C61, C93, Q15

1. Introduction

The management of irrigation water entails a number of issues related to the particular context of each country as well as to the diverse regions within a given country. These problems include, but are not limited to, climatic environment and production potentials; sources, amounts and quality of water resources; socio-economic conditions and revenues of irrigators; and market situation for agricultural production etc. The irrigation water distribution policy of the government has economic and political dimensions. It has both equity and efficiency implications.

A major issue is the allocation of water. Broadly speaking, allocation refers to the apportionment of water among users within and between sectors.

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More specifically, several different types of water allocation issues are economically important including apportionment among individual users, sectors (including off-stream and in-stream), over time and space dimensions and from alternative sources (such as surface or ground water). In this section, only the first two will be dealt with. Although allocation may require engineering facilities to store and transport water, the focus is on the institutional aspects of the topic (Young and Haveman, 1985).

Two broad topics are discussed here. One concerns the conditions for an economically optimum allocation of water. Economists define problems of water allocation in terms of how to achieve the most valuable gains. The second and more complex issue is the selection of institutional arrangements for allocating water. Institutional arrangements for allocation can be grouped into price-based or quantity-based instruments.

In many instances, particularly with irrigation water, the cost of measurement, administration and the uncertainty of water supply preclude the use of pricing as an allocative procedure. Several criteria are important in specifying quota or entitlement systems (Young and Haveman, 1985). Security of tenure - affording protection against legal and physical uncertainties - is one consideration. Another attribute is certainty--the rules of water use must be easy to discover and understand. Third, a desirable system should minimize the possibility that water users would impose uncompensated costs on third parties. Finally, the rules must be consistently and fairly enforced.

The size of the area supplied with water (16.8 million hectares) in the Indus Basin (MFA & L, 2006) and the general lack of surface storage preclude any demand delivery system so that farmers do not receive the desired amount of water when they want it. The amount of water available per unit area is not large, given a generally hot and arid climate. Water is delivered to individual land holdings on a rotational system termed the *warabandi.* Each water course takes its turn receiving water from distributing canals. Several (up to a dozen or more) turns are provided each year. During the watercourse turn, each land-holder, in sequence, receives the entire flow of the local watercourse, the amount of water determined by area of the holding (Hussain and Young, 1995).

Pakistan has the best irrigation system in the world. Indus and its tributaries supply surface water (114 BCM) at the farm gate through 40,000 miles long canals and 130,000 watercourses. Groundwater in the sweet zones is another important source of irrigation water (73.8 BCM annually). Of the total cropped area, 82 percent is irrigated, 43 percent through canals, 37 percent through conjunctive use and 17 percent through the sharing of tubewells. Irrigation water is subject to excessive withdrawal. There is a tendency towards excessive irrigation through surface supplies and ground water is overdrafted. The overall water conveyance efficiency is 45 percent: 75 percent from canal to outlet and 60 percent from outlet to farm gate. Thus, about 49 BCM water is lost to the system, 30.75 BCM canal to outlet and 18.45 BCM outlets to farm gate (MFA & L, 2006). Annually, 10 MAF is lost to the sea especially in the summers and during the monsoon season (WAPDA, 2000). Canal losses are attributed to delayed operation and maintenance practices. Farm gate losses are due to unlined watercourses and application inefficiencies.

The consumptive use of water per crop or per matured acre was quite low despite affordable supplies. The system losses and application inefficiencies undermined the consumptive use. The irrigated area by source of water was 43.3 percent, 37.4 percent, 16.7 percent and 2.6 percent through canal, canal cum tubewells, tubewells and other sources, respectively. Ground water was mined through public and private tube wells (900,000; MFA &L, 2006)

The management of a long canal system is a gigantic task. Irrigation experts often argue that maintenance of these canals is less than satisfactory. The maintenance is either deferred or adequate funds are not available to cover operation and maintenance (O&M) costs. As per a provision of the Canal Act 1934, the canals are annually closed to carry out O&M. Such an institutional arrangement entails attendant problems. One of the biggest issues is that canals are closed in a month, when water is needed most. There are canal closure rotations along with their distributaries. This institutional rigidity affects irrigators in sustaining the productivity of their crops. The canal closure period is often extended arbitrarily and most of the irrigators miss their turns for four to six weeks. Consequently, crop yields are stressed and affect the net returns of farmers adversely. Thus, the intent of this paper is to develop canal closure

scenarios and assess their impact on net farm revenue. The results entail useful implications for canal managers for improving delivery and application efficiencies.

A number of quantity-based approaches for allocating water to individual irrigation users have been applied. In the western United States, the prior appropriation doctrine of first in time-first in right is practiced (Getches, 1991). Economists, building on the path-breaking simulation modeling work of Maass and Anderson (1978), have studied alternative quota mechanisms for irrigation systems. Bowen and Young (1986) modeled a number of alternative irrigation water allocation and cost recovery methods (including both pricing and quota systems) with linear programming for a case study of Egypt. Accounting for administrative costs, conveyance losses and government commodity-price distortions, it was concluded that under the present water scarcity conditions, a water quota system combined with flat land taxes provided the best compromise among allocative and cost-recovery mechanisms. Johnson (1982) studied irrigation water allocation in Indonesia with an updating of the Maass-Anderson approach. Dudley (1992) and Paterson and Cayan (1989) present well-thoughtout analyses of quantity-based water allocation approaches from Australian perspectives.

2. Data and Methodology

Ideally, one should study the closure schedule of all canals, but due to data limitation and financial constraints, only Mitha Luck Distributory in Sargodha was selected to evaluate various canal closure schedules. In order to evaluate various scenarios, there was a need for a crop-water-response function. No such study was readily available to provide such information. Therefore, experimental data for water response was obtained from Mona Reclamation Project, Sargodha and Ayub Agricultural Research Institute, Faisalabad. The yield stress data of various crops is reported in Tables 1 through 5.

2.1. Linear Programming Model

The additional income from a crop or a farm was defined as the difference between Net Incomes With-or-Without Irrigation Improvement models (small, large, head and tail) developed on a Mitha Luck Distributory in the Indus Basin. This demonstrates the with-or- without principle for irrigation improvement and derivation of water charges (Change in Net Income—CINI).

In practical applications, irrigation water is often valued with the *Change in Net Income* (CINI) method. The willingness to pay for an increment of water is the net producer income associated with that increment. A process very similar to that used for residual imputation can represent this approach. It is designed to accommodate the case of a multi-product firm in addition to the individual crop model discussed above.

A more general multi-crop/multi-input production function can be written as:

$$F(Y_1,.....Y_m; X_1,.....X_n) = 0 \qquad (1)$$

Where: **Y** is a vector of outputs of feasible crops and **X** is a vector of production inputs. The net income (denoted by Z) from producing a given set of crops can be represented by:

$$Z = Ó_{i=1...m}(Y_i P_{yi}) - Ó_{j=1...n}(X_j P_{xj}) \qquad (2)$$

The Change in Net Income is:

$$\Delta Z = Z_1 - Z_0 \qquad (3)$$

Where: the subscripts 0 and 1 refer to the "without project" and "with project" situations, respectively.

The LP-matrix for the large farm is given in Appendix A. The matrices for other farm categories were not reported for the sake of brevity.

3. Results and Discussion

3.1. Canal Withdrawals in the Indus Basin

Of the total surface irrigation water 135 BCM diverted to canals, 70 percent of the water is withdrawn in Kharif season and 30 percent in the Rabi season. The canal withdrawals were quite erratic in the past decade depending upon the snowmelt and rainfall during the monsoon. The provincial share in the Kharif withdrawals were 49 percent, 47 percent and 4 percent and Rabi withdrawals were 54 percent, 43 percent and 3 percent in Punjab, Sindh, and Balochistan, respectively, in the year 1998-99. The availability of water as per canal withdrawals was 1.5 acre feet, 5 acre feet, 1.5 acre feet and 1 acre foot per cropped acre in Punjab, Sindh, Baluchistan, and NWFP, respectively. This showed that surface water was not enough to cater to the consumptive needs of crops. Thus, surface supplies were augmented with conjunctive use of tubewell water at very high pump cost. The surface water at the farm gate was only 114 BCM, of which 20.91 BCM was lost in the canal system. Conservation can occur through canal cleaning and regular repair and maintenance (MFA &L, 2006).

The escapage below Panjnad and Kotri is 27 BCM and 43 BCM, respectively, annually. The average flow below Kotri was as high as 57.8 BCM. The outflow was more in the months of July and August depending upon the volume of monsoon rainfall. The downflow below Panjnad goes to Indus, which can be further utilized, but escapage below Kotri (43 BCM) is cause for concern. Some of the outflow (12 BCM) is essential to check seawater intrusion and preservation of mangroves, but the rest needs to be conserved through construction of upstream dams (WAPDA, 2000).

Monthly canal withdrawals vary from month to month depending upon the rainfall and decision of the Indus River System Authority. The average monthly flow is 5.78 BCM with a coefficient of variation (CV) of 32 percent in Punjab, 4.79 BCM and CV of 51 percent in Sindh, 0.07 BCM and CV of 66 percent in NWFP, and 0.32 BCM and CV of 67

percent in Baluchistan (WAPDA, 2000). The monthly variations were quite high during the year in all the provinces.

This indicates that canal withdrawals were quite unstable due to ad hoc distribution of water and abrupt canal closures. The uncertain water supplies adversely affected the crop operations, and farmer decisions regarding crop choice. Time series analysis showed seasonality of withdrawals. The ARIMA showed that all series were integrated of order 1 in all the four provinces showing high seasonality. The series were adjusted through ARIMA and results indicated I(0). Figure 1 depicts the unadjusted and adjusted series for Punjab province. The coefficient of variation ranges between 22 to 31 percent in these two provinces. The mean flow of canal withdrawals was 66 BCM, 55 BCM, 1.008 BCM and 2.44 BCM in Punjab, Sindh, NWFP and Baluchistan, respectively, in the years 1989-90 through 1998-99 (WAPDA, 2000).

The Indus and its tributaries divert water through 40,000-mile-long canals. Some of the canals are perennial and others non-perennial. The canal system is divided into six zones based on particular river supplies. The Peshawar valley draws water mainly from rivers of Swat and Kabul. The total discharge capacity is 3350 cusecs encompassing a gross command area of 696,000 acres. All canals are perennial and the net irrigated area is 606,000 acres depicting average irrigation intensity† of 87 percent. The second is the Northern Zone-Indus Plains drawing water from Jehlum, Chenab, and Ravi rivers. The capacity of canals from the Jhelum River is 7000 cusecs, gross command area is 2.2 million acres, perennial net irrigation area is 1.6 million acres and non-perennial is 389,000 acres. The irrigation intensity is 93 percent. The total canal capacity from Chenab River is 25500 cusecs with gross command area (GCA) of 6.9 million acres. The net irrigated area (NIA) through perennial canals is 4.3 million acres and non-perennial is 1.6 million acres. The average irrigation intensity on these canals is 86 percent. Most of the waters of River Ravi are lost to India under the Indus Water Treaty (1960); however, downflow streams supply water to Center and Lower Bari Doab canals with total capacity of 14100 cusecs. The GCA is 2.5 million acres, perennial NIA is 2 million acres, and non-perennial NIA is 43000 acres showing acreage

† *Irrigation Intensity is defined as net irrigated area/gross command area × 100*

irrigation intensity of 83 percent. The third zone in northern plain drainage water is Sutlej and Panjnad. Most of the canals are non-perennial. The total capacity is 10100 cusecs. The GCA is 1-6 million acres of which 0.51 million acres are served through perennial sources and 6.94 million acres through non-perennial sources. The average irrigation intensity of these canals is 89 percent. The fourth zone is northern plain drainage water mainly from the Indus River. The capacity of this is huge (110900 cusecs) with GCA of 22 million acres. Of the total GCA, 13.57 million is irrigated through perennial canals and 5.96 million acres through non-perennial. The irrigation intensity is 88 percent. The southern plain on Indus River includes Pat Feeder, desert, and Begari Sindh and Ghotki canals with 45200 cusecs capacity. The GCA is 3.26 million acres. All the canals are non-perennial, covering an area of about 3 million acres with an irrigation intensity of 92 percent. The last and the second largest southern plain, River Indus, has a capacity of 181900 cusecs to provide irrigation water to 14.46 million acres. The perennial area is 7.29 million acres and non-perennial is 5.6 million acres. The irrigation intensity is 92 percent (WAPDA, 2000).

3.2. Yield Stress and Growth Curves

Wheat was the most prominent crop of the study area. The stages of wheat crop growth was initial (20 days), development stage (30 days), middle stage (60 days) and the maturity stage (30 days). The middle stage comprised of January and February, which were critical months having the maximum crop coefficient (KC) (1.15). In these months, water becomes the limiting factor for crop growth. Figure 2 and Figure 3 give a clear picture of wheat crop growth and yield stress in the critical months.

The critical months for sugarcane were May through August as shown in Figure 4. Sugarcane had the maximum KC values during May-June and the lowest during September-October. The yield responses for rice and cotton are given in Figure 5 and Figure 6. The citrus yield is stressed in the month of November through January.

Maize crop growth stages were: initial (15 days), development (28 days), middle (40 days) and maturity (25 days). The yield stress months correspond to crop growth stages as depicted in Figure 7 and Figure 8.

3.3. The Economic Impact of Canal Closure on Net Farm Revenue

The stress yields of various crops in critical months were incorporated in the objective function of the four categories of farms of Mitha Luck Distributory, Sargodha. All the four models, namely, small; large; head; and tail form, were evaluated to assess the reduction in farm revenue in a particular closure month. Traditionally, the canals are closed in the month of January for O&M. The water activities are also shown month-wise in the LP-Matrix (Appendix A).

The Mitha Luck Distributory is over 27 miles long. It was closed for 15 days for each season for the past 14 years and coefficient of variation was 72 percent, which showed tremendous variation in seasonal canal closure. Bhutta *et al.,* (1991) revealed that the variability at the head of distributaries is much greater than the variability in the Gugera Branch under existing operational practices. The distribution of water among the distributaries is rarely in accordance with design criteria. Some channels get priority over other channels. The annual closure period varies from 17 to 41 days for different channels. The discharge at the head of distributaries remains lower than the standard operational range for 69 to 183 days in a year. Various monthly Rabi and Kharif crop scenarios were developed to evaluate the models for canal closure. In the case of small farm, April month was more suitable for canal closure. The value of the objective function declined by 4 percent only as compared to January, August and October closures (26 percent decline in the objective function). The canal closure at large farm was also suitable in the month of April in which the value of the objective function declined by 4.4 percent. In the case of head farm, the loss in revenue was 8 percent when canal was closed in the month of April. At the tail end, the value of the objective function was lowest again in the month of April (10 percent) as compared to other months.

As regards the large farms, again April was an appropriate month for canal closure when the damage would be minimized. Similar was the situation for

head tail farms suggesting a canal closure in the month of April, when reduction in farm revenue would be less. In sum, net farm revenue was higher by Rs. 1658 per acre, Rs. 328 per acre, Rs 922 per acre, and Rs 1972 per acre in April instead of January canal closure on small, large, head and tail farms, respectively. The results were consistent with Johnson and Reuss (1984) who revealed that canal closure in February to April, rather than December and January, would increase per hectare returns by US $15-35 in the Punjab. The water productivity (Rs/m^3) was higher in the month of April compared to January, August and October closures**.** The results are shown in Tables 1 through 10.The results of the study reveal that canal authorities must consider changing the canal closure schedule in a month when there is less damage to crop yield due to water stress. The month of January was the critical month for wheat crop when most crop tilling and boot formation takes place. Thus, closure of canals in the month of January, August and October depresses the crop yield, farm revenue, and water productivity.

Table 1: Wheat Yield Stress due to Shortage of Irrigation Water

S.No.	Stress Month	Normal Yield (40 Kg/acre)	Stressed Yield(40 Kg/acre)	Yield Loss (Percent)
1	January	25.62	19.4	-32.06
2	February	25.62	22.25	-15.15
3	March	25.62	23.22	-10.34
4	April	25.62	19.41	-31.99

Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.

Table 2: Sugarcane Yield Stress due to Shortage of Irrigation Water

S.No.	Stress Month	Normal Yield (40 Kg/acre)	Stressed Yield (40 Kg/acre)	Yield Loss (Percent)
1	January	590	498	-18.47
2	February	590	460	-28.26
3	March	590	551	-7.08
4	April	590	545	-8.26
5	May	590	467	-26.34
6	June	590	450	-31.11
7	July	590	431	-36.89
8	August	590	505	-16.83
9	September	590	479	-23.17
10	October	590	546	-8.06
11	November	590	546	-8.06
12	December	590	546	7.46

Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.

Table 3: Citrus Yield Stress due to Shortage of Irrigation Water

S.No.	Stress Month	Normal Yield (Kg/acre)	Stressed Yield (Kg/acre)	Yield Loss (Percent)
1	January	32500	25665	-21.03
2	February	32500	28560	-12.12
3	March	32500	31167	-4.10
4	April	32500	32305	-0.60
5	May	32500	32435	-0.20
6	June	32500	31037	-4.50
7	July	32500	30550	-6.00
8	August	32500	28486	-12.35
9	September	32500	28128	-13.45
10	October	32500	28080	-13.60
11	November	32500	27224	-16.23
12	December	32500	24881	-23.44

Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.

Table 4: Rice Yield Stress due to shortage of Irrigation Water

S.No.	Stress Month	Normal Yield (40 Kg/acre)	Stressed Yield (40 Kg/acre)	Yield Loss (Percent)
1	July	29.24	21.98	-33.03
2	August	29.24	24.31	-20.28
3	September	29.24	26.16	-11.77
4	October	29.24	27.83	-4.82
5	November	29.24	28.94	-1.04

Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.

Table 5: Cotton Yield Stress due to Shortage of Irrigation Water

S.No.	Stress Month	Normal Yield (40 Kg/acre)	Stressed Yield (40 Kg/acre)	Yield Loss (Percent)
1	July	16.15	11.85	-36.29
2	August	16.15	12.93	-24.90
3	September	16.15	14.38	-12.31
4	October	16.15	15.55	-3.86
5	November	16.15	15.69	-2.93

Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.

Table 6: Maize Yield Stress due to Shortage of Irrigation Water

S.No.	Stress Month	Normal Yield (40 Kg/acre)	Stressed Yield (40 Kg/acre)	Yield Loss (Percent)
1	April	34.46	25.14	-37.07
2	May	34.46	22.32	-54.39
3	June	34.46	27.11	-27.11

Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.

Table 7: Economic Impact of Canal Closure Months on the Objective Function Value of the Model on Small Farm at Mitha Luck Distributory, Sargodha

S.No.	Model Description (Closure Month)	Existing Net Farm Revenue (Rs.)	Objective Function Value (Rs.)	Percent Change	Water Productivity Rs/m^3
1	January	121356.6	106551.1	-12.2	4.44
2	April	121356.6	116502.4	-4.0	4.86
3	August	121356.6	106575.4	-12.2	4.44
4	October	121356.6	88808.8	-26.8	3.70

Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.

Table 8: Economic Impact of Canal Closure Months on the Objective Function Value of the Model on Large Farm at Mitha Luck Distributory, Sargodha

S.No.	Model Description (Closure Month)	Existing Net Farm Revenue (Rs.)	Objective Function Value (Rs.)	Percent Change	Water Productivity Rs/m^3
1	January	463452.5	413333.8	-10.8	13.47
2	April	463452.5	442839.2	-4.4	14.43
3	August	463452.5	431388.6	-6.9	14.05
4	October	463452.5	381203.3	-17.7	12.42

Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.

Table 9: Economic Impact of Canal Closure Months on the Objective Function Value of the Model on Head Farm at Mitha Luck Distributory, Sargodha

S.No.	Model Description (Closure Month)	Existing Net Farm Revenue (Rs.)	Objective Function Value (Rs.)	Percentage Change	Water Productivity Rs/M^3
1	January	274176.1	236600.2	-13.7	7.25
2	April	274176.1	251844.6	-8.1	7.72
3	August	274176.1	241902.3	-11.8	7.41
4	October	274176.1	229345.6	-16.4	7.03

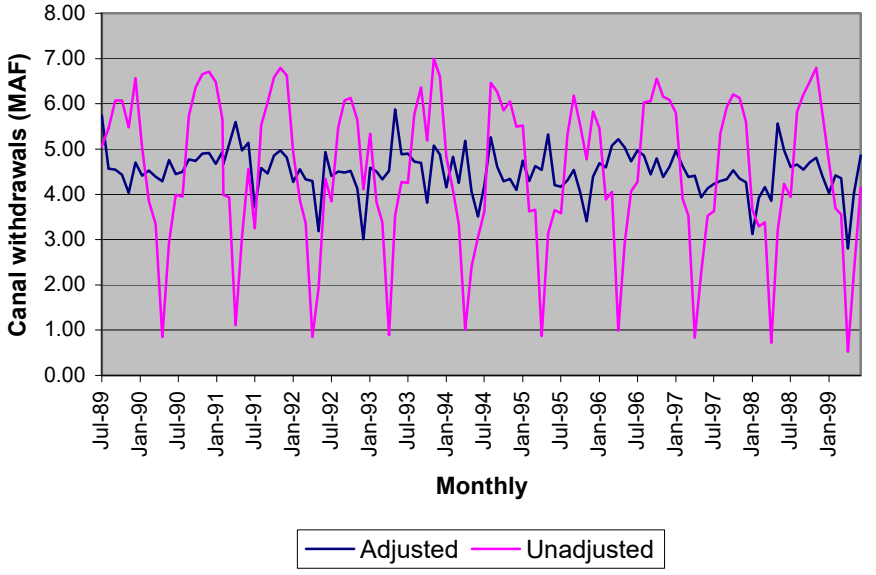
Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.

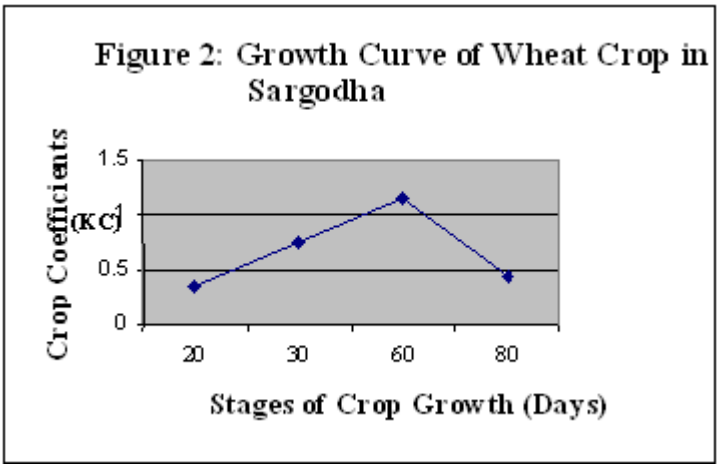
Table 10: Economic Impact of Canal Closure Months on the Objective Function Value of the Model on Tail Farm at Mitha Luck Distributory, Sargodha

S.No.	Model Description (Closure Month)	Existing Net Farm Revenue (Rs.)	Objective Function Value (Rs.)	Percent Change	Water Productivity Rs/M^3
1	January	197633.2	166011.9	-16.0	7.99
2	April	197633.2	177646.9	-10.1	8.55
3	August	197633.2	164372.1	-16.8	7.91
4	October	197633.2	142083.5	-28.1	6.84

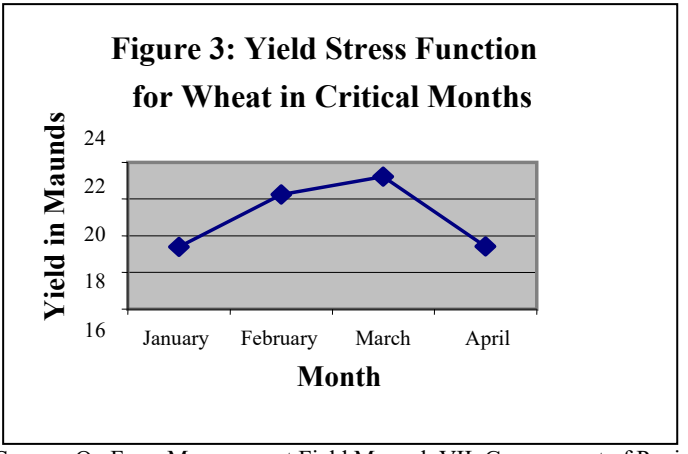
Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.

Figure 1: Monthly Canal Withdrawals in Punjab





Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.



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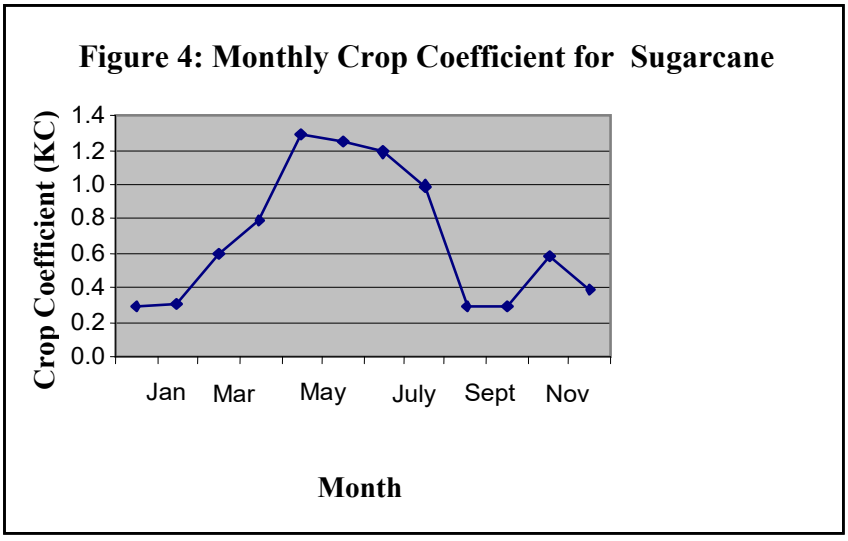

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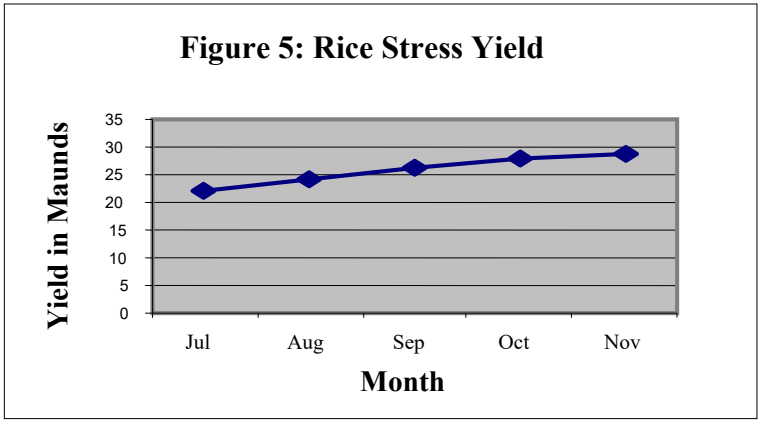
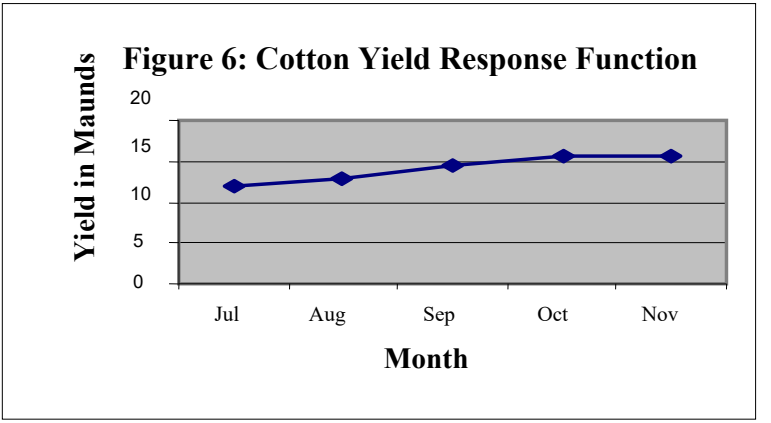
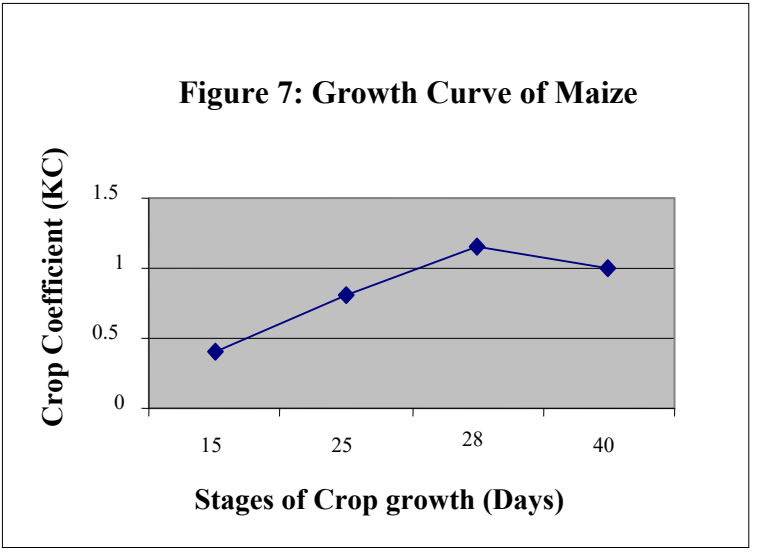


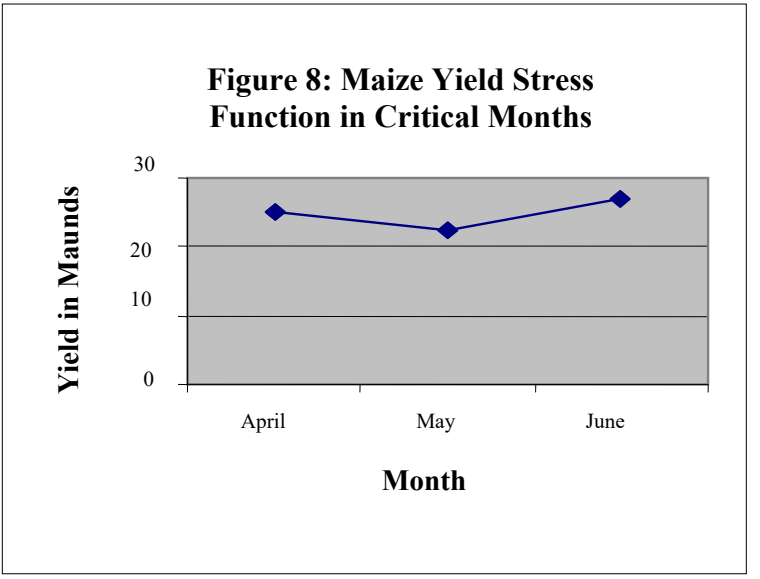
Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.



Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.



Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.



Source: On Farm Management Field Manual, VII, Government of Punjab, Lahore.

4. Conclusions and Recommendations

The canal system, spread over 40,000 miles in the Indus basin, is supply-oriented and the command area is nearly 16.8 million hectares. The delivery system on canal and watercourse is fixed through a water turn termed as *warabandi*. Each individual irrigator is allowed a water allowance of nearly 30 minutes per acre, which varies from canal to canal. The farmer has no choice, but to avail the sanctioned strength of water at a particular time in a week or through the 10-day rotational supplies. Furthermore, canal authorities close the canals in critical months; for instance, in January, when the wheat crop requires water for tilling and boot formation. The experimental data amply shows that crop yields are stressed out if water is not supplied during growth period. In view of the above, the present paper developed monthly scenarios to demonstrate that farm revenue is grossly affected when canals are closed in critical months.

The analysis shows that January, August and October were the months when crop revenue was adversely affected in the canal command area in the central Punjab. The net revenue per acre was higher during canal closure in April instead of January. This trend was observed at all

categories of farm in the study area. The water productivity in the month of April was Rs 4.86/m^3, Rs14.43/m^3, Rs 7.72/m^3, and Rs.8.55/m^3**,** on small, large, head and tail farms, respectively, which was higher than in January, August and October canal closures. The canal management authorities should revisit their water allocative rules and canal schedules so that farm net revenue is least penalized. There is some inherent inefficiency in the canal management; if the authorities make allocative rules flexible and farmer friendly, such inefficiency can be avoided.

Due to the restricted capacity of the present canals, changing from an incessant flow to a demand system does not appear to be economically practicable. Pumping additional water from private wells is much more engaging as it removes the need for supplemental public outlay in ground water development and devolution of operation facilities. Rotational schedules of distributaries are not adhered to as per design and need improvement. Most of the existing head release associations of discharge measuring structures are not consistent. A recurrent calibration of these structures is suggested.

References

Bhutta, M. N., Latif, M. and J. W. Kijne 1991. "A study of water distribution from a branch to distributary canals: A case study of Gugera Branch, Punjab, Pakistan" *Irrigation and Drainage Systems* 5(3): 229-247.

Bowen, R.L. and R.Young 1986. "Financial and economic irrigation benefits function for Egypt Northern Delta" *Water Resources Research* 21(8): 1329-1335.

Dudley, N. 1992. "Water allocation by markets, common property and capacity sharing: Companions or competitors?" *Natural Resources Journal* 32(4): 757-778.

Getches, H. 1991. "Water allocation during drought in Arizona and southern California: Legal and institutional responses" Boulder, CO: University of Colorado Natural Resources Law Center.

Hussain, R. Z. and R.A.Young 1995. "Estimates of the economic value productivity of irrigation water in Pakistan from farm survey" *Water Resource Bulletin* 21(6): 1021-1027.

Johnson, S.H.(III), 1982. "Large scale irrigation and drainage schemes in Pakistan" *Food Research Institute Studies* 18: 149-180.

Johnson, S. H.(III) and J.O. Reuss 1984. "Economics of changes in irrigation management in Pakistan: An integrative modeling approach" *Water International* 9(2): 66-71.

Maass, A. and R. Anderson 1978. "And the deserts shall rejoice: Conflict, growth and justice in arid environments" Cambridge, MA: MIT Press.

Ministry of Food, Agriculture and Livestock 2006. *The yearbook of agricultural statistics of Pakistan.* Islamabad: Printing Corporation of Pakistan (Pvt.) Ltd.

Peterson, D.H. and D.R. Cayan 1989. "The influence of north Pacific atmosphere circulation on streamflow in the west" Geophysical Monograph, No. 55: pp. 375-397. Washington, DC: American Geophysical Union.

Water and Power Development Authority 2000. *Directorate of water management*. Lahore: WAPDA.

Young, R.A. and R. H. Haveman 1985. Economics of water resources: A survey. In: Kneese, A. V. & Sweeney, J. I, eds. *Handbook of natural resources and energy economics.*Vol1,465-521.NewYork:North-Holland.

Appendix A

LP Matrix for Large Farm in Mitha Luck Distributory, Sargodha, Punjab

Activity	Cotton	Wheat	K.Fodder	Sugarcane	R.Fodder	Rice	Maize	Citrus	Wheat+Citrus	Berseem +Citrus	RHS
Obj. (Rs)	19805	10846	3848	32217	12433	16625	12084	38000	39500	36500	
Land (Acres)											
Kharif	1		1	1		1	1	1	1	1	≤32
Rabi		1		1	1			1	1	1	≤32
Labor (M.Days)											
January		0.64		15.72	9.37		4.94	5.31	5.85	15.62	≤150
February		0.54		18.86	9.37		4.92	5.31	8.83	15.25	≤150
March		0.59		0.79	9.37		5.48	8.24	14.45	20.15	≤150
April		4.0	3.18	0.79	11.25		0.79	10.45		14.00	≤150
May			0.79	0.79	0.79						≤150
June	1.84		5.31	3.3		3.3	3.3	3.3			≤150
July	2.30		5.31	0.79		0.79	0.79	0.79			≤150
August	3.23		3.18	7.07		079	079	0.79			≤150
September	4.61			0.79		2.30	2.30	2.31	8.66		≤150
October				4.39	1.5	3.5	2.41	2.41	12.92		≤150
November		2.19		0.79	6.25	3.93	3.23	5.42	5.16		≤150
December		0.54		0.79	7.5		4.92	4.63	6.24	15.00	≤150
Water (Acre Inches)											
January		2.82		2.32	7.61		4.23	2.3	2.3	2.0	≤62.67

February		**2.82**		**3.86**	**4.57**		**2.51**	**3.5**	**3.5**	**3.5**	**≤76.99**
March		**2.82**		**3.46**	**1.53**		**0.85**	**2.0**	**2.0**	**2.0**	**≤102.64**
April		**0.94**		**3.46**				**1.5**	**1.5**	**1.5**	**≤102,64**
May			**2.41**	**3.46**				**4.0**	**4.0**	**4.0**	**≤102.46**
June	**2.78**		**2.41**	**4.15**				**4.0**	**4.0**	**4.0**	**≤128.34**
July	**2.78**		**2.41**	**4.63**				**5.0**	**2.3**		**≤128.34**
August	**2.78**		**1.2**	**4.63**				**5.0**	**3.5**		**≤102.64**
September	**2.78**			**4.63**			**5.07**	**4.0**	**3.0**		**≤129.23**
October				**4.63**	**9.11**		**5.07**	**3.0**	**3.5**	**4.0**	**≤98.01**
November		**3.29**		**3.86**	**9.11**			**4.0**	**4.0**	**4.0**	**≤80.44**
December		**2.82**		**1.54**	**9.11**			**5.0**	**4.0**	**4.0**	**≤57.74**
N (NKg)	**21.62**	**22.77**		**23.99**	**11.50**	**52.0**	**23**	**56**	**36**	**31**	**≤1000**
P (NKg)	**32.37**	**20.64**	**0.0**	**33.98**	**10.33**	**22.00**	**17**	**45**	**49**	**45**	**≤500**

Buy	**Jan**	**Feb**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**N**	**P**	**W**
Labor (Rs)	**90**	**90**	**90**	**90**	**90**	**110**	**110**	**90**	**90**	**90**	**90**	**90**			
Fertilizer (Rs./NKg)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**19.30**	**45.32**	
Water Rs/Acre Inch)	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**100**

Socio-economic Implications of Changing Demographic Trends in Pakistan

Rizwan Ahmad and Parvez Azim *

Abstract: The main purpose of this paper is to investigate the social and economic implications of demographic changes in Pakistan. The paper also highlights the relative position of Pakistan in a rapidly ageing world. In the coming half century, demographic changes in Pakistan will bring substantial changes in dependency ratios, potential support ratio, index of ageing, and ratio of working age-to-dependent population. By the year 2050, Pakistan will have a youthful population as compared to both developed and developing countries. Appropriate policies will be required to convert this young segment of population into a productive labor force.

Keywords*:* Demographic Change, Demographic Dividend
JEL Classification*:* J11, J18

1. Introduction

During the last century, the size and composition of the world's population has gone through a dramatic change. From the year 1900 to 1950, the world population grew from 1.6 billion to 2.5 billion persons. In the following five decades, it has more than doubled, approached 6 billion at the end of the twentieth century and is projected to reach 9.3 billion by the year 2050 (United Nations, 2004). The ageing process has set in not only in the developed countries but also in a number of developing countries.

In many developing countries, including Pakistan, however, the demographic process has not advanced greatly and the share of working-age population will increase in the coming decades (Figure 1). This change in age structure of population can play an important role in the economic performance of a country (Ross, 2004). United Nations projections indicate that over the next 50 years, all European nations as well as Japan will face the problem of ageing population. By the year

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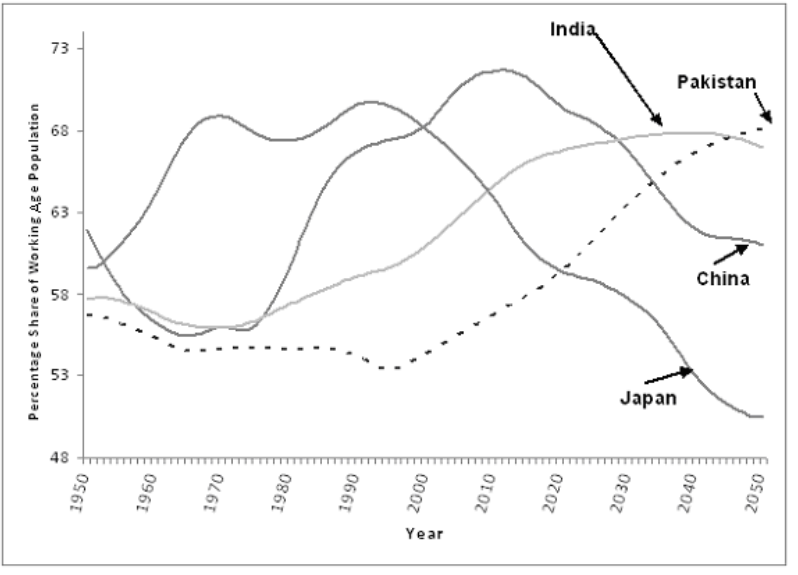
2050, the number of older persons in the world will exceed the number of young persons for the first time in history. Moreover, the trend of ageing population is irreversible and it is unlikely that the young populations of the past would occur again (United Nations, 2002).

A country with a high proportion of working age population and low proportion of dependant population may enjoy a boost in economic growth. This phenomenon of high proportion of working age and low proportion of dependent population is known as the demographic dividend.

A numbers of researchers (Bloom *et al*., 2001; Mason, 2001; Ross, 2004; Lee *et al.,* 2006*;* and Nayab, 2008) have already claimed that developing countries may make use of this demographic dividend for their economic development. But this demographic dividend can only be utilized for the well-being of the country if effective and timely policies are formulated and implemented to convert the youthful population into productive labor force (Bloom *et al.,* 2001).

Figure 1: Percentage Share of Working Age Population for Selected Countries



Source: World Population Prospects: The 2006 Revision (United Nations, 2007)

A timely recognition of this opportunity holds great potential benefit for a country and failure to act on this opportunity could have damaging consequences for future prospects of a country like Pakistan. Understanding and embracing this demographic challenge must, therefore, be a priority for all governments (Bloom *et al.,* 2003). Pakistan has also entered into the stage of demographic transition when the population of children born in a period of high fertility is coming of working age; this will increase the share of working age and youthful population in the country. The main purpose of this article is to analyze the demographic changes that are taking place in Pakistan and their future social and economic consequences. A comparison between Pakistan and other countries of the world has also been made to see the relative position of Pakistan in a rapidly ageing world. Characteristics of this paper are as follows:

The first section is an introduction of the topic; the second section gives an overview of the literature about changes in age structure and demographic dividend. The third section examines the changing age structure in Pakistan and its impact on different demographic ratios and indices for the period of hundred years from 1950 to 2050. In addition to these, this section will also make a comparison between Pakistan and other regions of the world on the basis of projected demographic changes. The fourth section highlights the social and economic implications of future population change in Pakistan and gives policy recommendations.

2. Age Structure and Demographic Dividend

The East Asian economic miracle provides an evidence of how demographic transition can play an important role in the development process of a country (Mason, 2001). A changing age structure in East Asian countries was one of the critical factors that contributed to their economic growth (Bloom and Williamson, 1998). In East Asian countries, from 1965 to 1990, per capita income rose annually by more than 6 percent while during that period, the share of working age population grew four times faster than the share of the dependent population (Bloom *et al.,* 2003).

A study by Bloom and Williamson (1998) showed that about one-third of East Asian economic growth was due to the demographic dividend. Japan is another example that is now coming towards the end of its demographic transition. From 1950 to 1970, Japan enjoyed a rapid decline in young age dependency ratio, which caused the total dependency ratio to fall. During that period, GDP growth rate in Japan was an average 8 percent per year. Since then, the population of Japan has been ageing rapidly and GDP growth rate has also been falling. By the year 2050, 36 percent of the population of Japan will be 65 years or above. A direct impact of this growing old-age dependency ratio will be an increase in total dependency rate, and by the year 2050, total dependency ratio will be 85 percent (Horlacher and Mackellar, 2003). The Japan Center for Economic Research has also projected that over the next 25 years, GDP growth will fall further (Horlacher and Mackellar, 2003). Another study by Jackson and Felmingham (2003) shows that in Australia, by the year 2011, ageing population will reduce aggregate income by 1.9 percent, and 8.6 percent by the year 2050.

In Pakistan, Arif and Chaudhry (2008), by using data from Pakistan Demographic Survey and Labor Force Survey, found that demographic dividend in terms of rising share of youth in total population depends upon the development of human development and absorption capacity of labor market. Nayab (2008) shows that due to increase in the share of working age population, Pakistan has entered into the phase of demographic dividend. She has also shown that demographic change can be a threat if appropriate policies are not adopted to absorb this working age population in the labor market.

3. Past, Current and Future Population of Pakistan

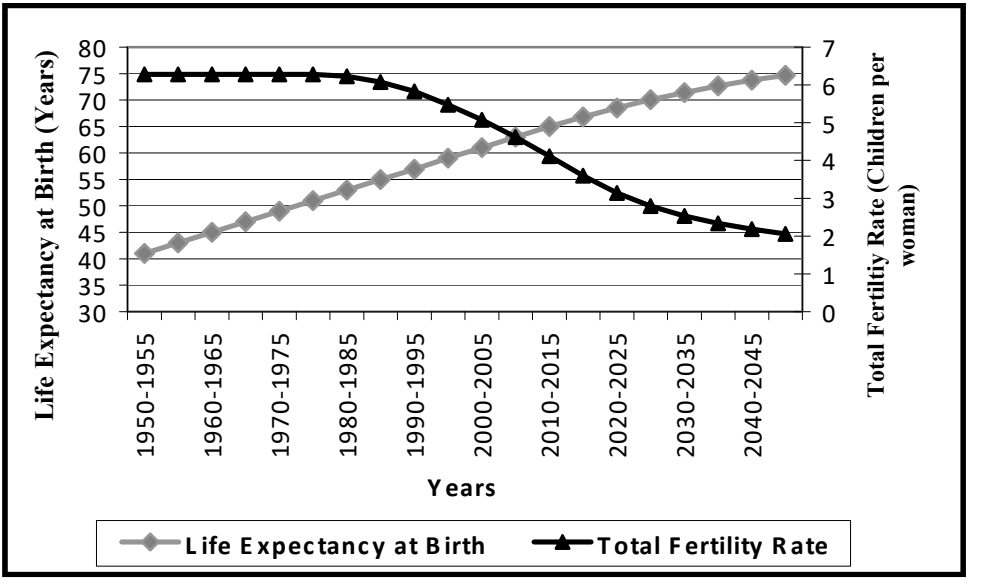
At the time of independence, Pakistan was the 14th most populated country in the world with a total population of 36.94 million people and at the start of 21st century, Pakistan became the sixth most populated country in the world with a total population of 144.36 million people. Such a huge increase in population was due to high population growth rate, increase in life expectancy at birth, and high fertility rate (Figure 2). Although population growth has slowed down to 1.8 percent per annum, it remained

on average at 3 percent per annum for almost four decades (from 1951 to the mid-1980s). From 1950 to 2000, life expectancy increased from 43 years to 61 years, while total fertility rate never fell below 5 children per woman. At present both population growth rate and fertility rate are falling and according to population projections of the United Nations, by the year 2050, Pakistan will be the 4th most populated country in the world with a total population of 292.22 million (United Nations, 2007).

3.1 Age Structure Transition in Pakistan

Age composition of population plays an important role in economic and social development of a country. Since 1950, the population age structure of Pakistan has changed from high proportion of younger population (below 15 years) to high proportion of working age population (15 to 64 years). The process of demographic transition from young population to youthful population for Pakistan can be seen in Figure 3.

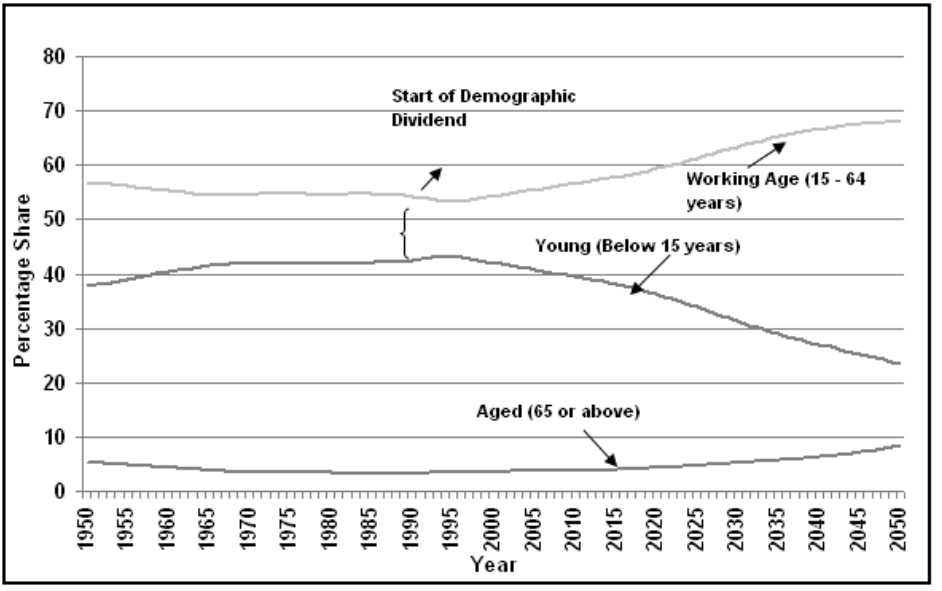
Figure 2: Life Expectancy at Birth and Total Fertility Rate (Pakistan)



Source: World Population Prospects: The 2006 Revision (United Nations, 2007)

It clearly indicates the start of a demographic dividend and a potential opportunity of a huge labor force in the future. From 1950 to 2000, the proportion of younger people rose from 37.9 percent to 42 percent, while proportion of working age group (15-64) declined slightly from 56.7 percent to 54.3 percent. Over the next half century (2000-2050), proportion of working age population is projected to rise and proportion of younger population will decline substantially (Figure 3).

Figure 3: Changing Age Structure in Pakistan



Source: World Population Prospects: The 2006 Revision (United Nations, 2007)

By the year 2050, population projections show that the percentage of working age population will rise up to 68.1 percent, while that of younger people will fall to 23.5 percent (Table 1). It is projected that ageing population in Pakistan will not start till 2020, as share of population above 65 will remain below 5 percent. This proportion of old age population will start to increase after the year 2030 and by the year 2050, Pakistan will have to face the problem of ageing population as the share of older people will be 8.4 percent of the total population (Table 1).

Table 1: Indices of Age Structure and Dependency Ratios in Pakistan, 1950-2050.

Year	Total Population (in 000)	Percentage of Population			Dependency Ratios		
		Below 15	15 to 65	Above 65	Young Age	Old Age	Total
1950	36944	37.9	56.7	5.3	66.89	9.42	76.31
1960	46259	40.3	55.3	4.4	72.84	7.89	80.73
1970	59566	41.9	54.6	3.5	76.60	6.43	83.03
1980	79222	42.0	54.6	3.4	76.89	6.17	83.06
1990	112991	42.5	54.2	3.3	78.36	6.14	84.50
2000	144360	42.0	54.3	3.6	77.38	6.69	84.07
2010	173351	39.5	56.7	3.8	69.67	6.77	76.44
2020	208315	36.3	59.4	4.4	60.03	7.43	67.46
2030	240276	31.3	63.4	5.3	49.36	8.35	57.71
2040	268506	27.0	66.6	6.4	40.50	9.54	50.04
2050	292205	23.5	68.1	8.4	34.50	12.35	46.85

Source: World Population Prospects: The 2006 Revision (United Nations, 2007)

3.2 Magnitude and Speed of Demographic Changes in Pakistan

Table 2 shows the speed of demographic changes in Pakistan from 1950 to 2050. During the second half of the last century, the pace of demographic change was not the same. From 1950 to 1990, the total population of Pakistan increased at an increasing rate. Since then, the total population has been increasing at a decreasing rate and will continue to do so till 2050 (Table 2). One important point to be noted here is that whenever total population increases at an increasing rate, the share of children increases in the total population, and whenever the total population increases at a decreasing rate, the share of children in total population declines and that of working age and aged population increases (Tables 1 & 2). By the year 2050, total population of Pakistan will be 690.94 percent higher than what it was in the year 1950 and the share of young population (under 15 years) in total population will be 38 percent

less than what it was in the year 1950. This shows that young dependency ratio will decline over the years. On the other hand, within a period of hundred years (1950-2050), the share of working age population (15-64) will increase by 20 percent and share of aged population (65 and above) in the total population will increase by 57.34 percent (Table 2).

Table 2: Speed of Demographic Changes in Pakistan, 1950-2050.

Year	Percentage Change in			
	Total Population	**Below 15 Years**	**15 to 65 Years**	**Above 65 Years**
1950-60	25.21	6.24	-2.45	-18.29
1960-70	28.76	3.84	-1.25	-19.60
1970-80	33.00	0.36	-0.02	-3.99
1980-90	42.63	1.11	-0.77	-1.32
1990-2000	27.76	-1.02	0.23	9.27
2000-2010	20.08	-6.07	4.32	5.60
2010-2020	20.17	-8.08	4.73	13.37
2020-2030	15.34	-13.76	6.83	21.65
2030-2040	11.75	-13.76	5.12	20.07
2040-2050	8.83	-12.97	2.17	32.29
Percentage Change (1950-2050)	690.94	-38.07	20.07	57.34

Source**:** World population Prospects: The 2006 Revision (United Nations, 2007)

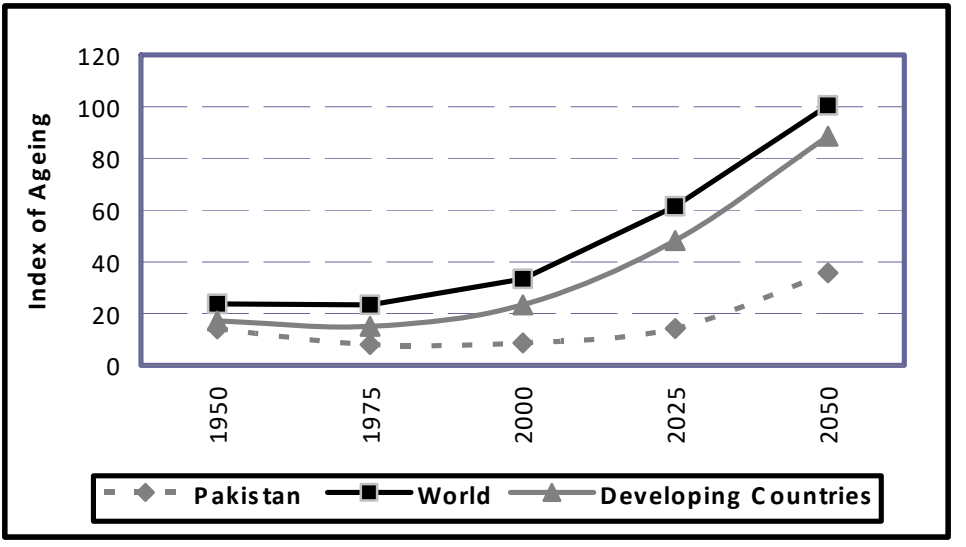
4. A Youthful Pakistan in the Ageing World

This section provides a comparison between Pakistan and other major regions of the world to show the relative position of Pakistan. Rapid demographic transition in Pakistan has changed the balance between different age groups. Different indices and ratios such as ageing index, ratio of working age to dependent population, dependency ratios, and potential support ratio have been calculated to show the demographic changes in Pakistan for the period of one hundred years from 1950 to 2050.

4.1 Index of Ageing

Index of Ageing is a measure to show whether a population is getting older or younger. It is the ratio of people aged 65 and over to the children younger than 15 years of age. In 1950, Index of Ageing in Pakistan was 14.09; thereafter, it continued to decline for the next four decades and it was just 7.83 in 1990, implying that population of Pakistan was getting young. This fall in Index of Ageing was due to high fertility rate and falling infant mortality rate in Pakistan. Later, fertility rate started to decline and so did the Index. Future trend shows that from 2020 onwards the Index of Ageing will start to rise and will be 36 in 2050 (Figure 4). This figure is still well below the world's Index of Ageing, as well as that of less developed countries (Figure 4).

Figure 4: Index of Ageing



Source: World Population Prospects: The 2006 Revision (United Nations, 2007)

It is to be noted that the trends during the period under consideration (in Figure 4) were less sharp in Pakistan as compared to the world and developing countries. In the year 2050, globally there will be 101 older people for every 100 children below 15 years of age. This ratio will be 89

in developing countries, 215 in developed countries, and in Europe there will be 263 older people for every 100 children (United Nations, 2002).

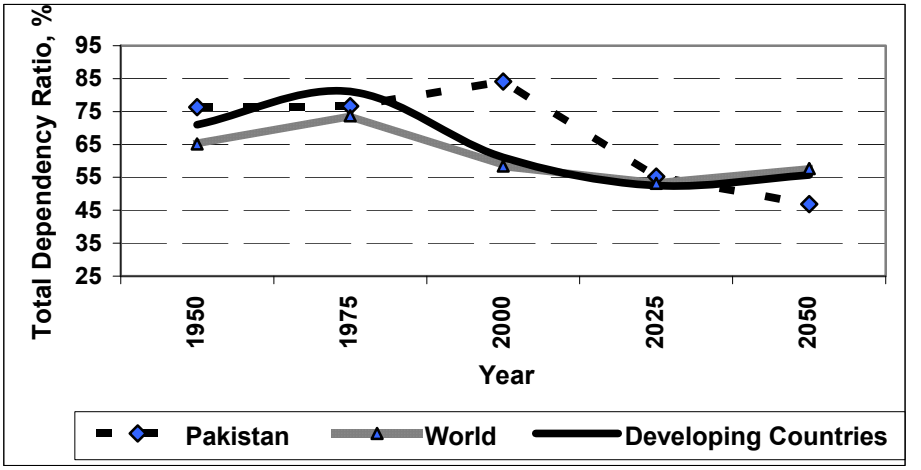
4.2 Dependency Ratios

Dependency ratio shows the burden of dependency on working age population (15-64 years). The working age population is assumed to provide support to the dependent population i.e. population under 15 years of age and population above 65 years of age (Kinsella and Gist, 1995). However, it must be recognized that in a country like Pakistan, neither all population below 15 years or above 65 years of age are dependents, nor do all members of population at the working age provide support to the dependent population.

During 1950 to 2000, total dependency ratio in Pakistan rose from 76.3 percent to 84 percent. It implies that in the year 2000, there were 84 dependents per 100 persons of working age (15-64 years). Out of these 84 dependents, 77.38 were young dependents and only 6.62 were elderly. In the period under consideration, the percentage of young dependents has been rising and that of old dependents has been falling. This shows a period of baby boom and high population growth rate in Pakistan. But in the last decade of the past century, young dependency rate started to fall slightly and this trend will continue even for the next half century (Figure 5a). In the year 2000, total dependency ratio in Pakistan was 84.1, which was greater than the dependency ratio of the world and developing countries.

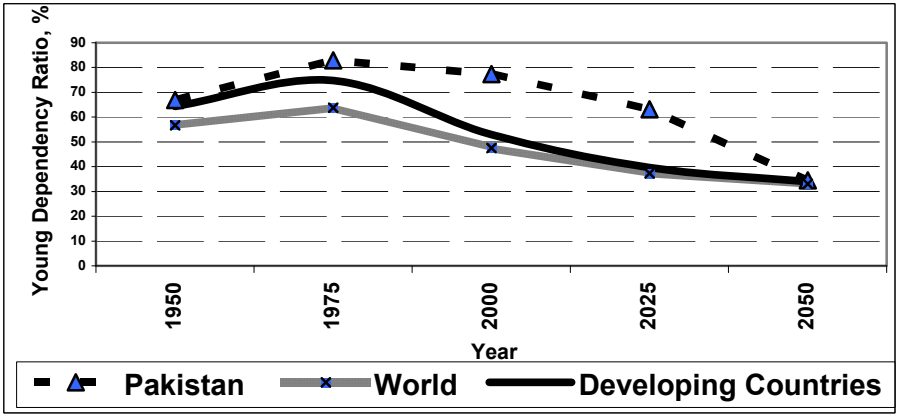
By the year 2050, dependency ratio of Pakistan will be less than the average dependency ratio of the world and developing countries (Figure 5a). One important point to be noted is that in 1950, the younger population accounted for the major portion of dependency ratio, while in the year 2050, old age dependency will account for the major portion of dependency ratio, not only in Pakistan, but also in other developed and developing countries (Figures 5b and c).

Figure 5a: Total Dependency Ratio



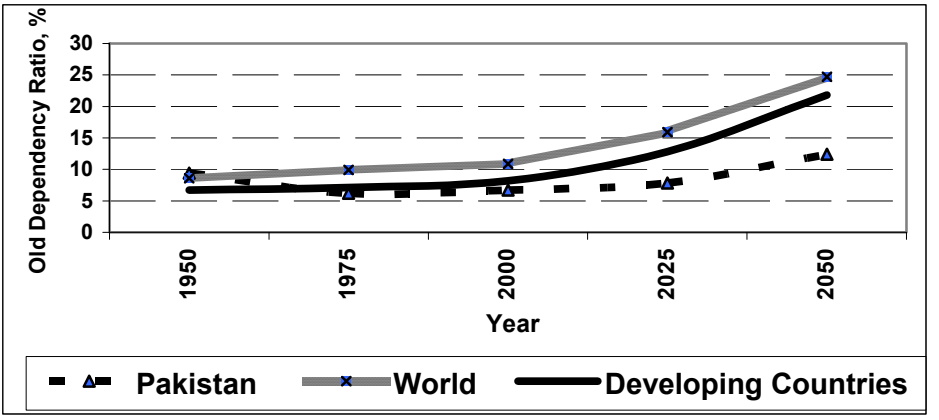
Source: World Population Prospects: The 2006 Revision (United Nations, 2007)

Figure 5b: Young Dependency Ratio



Source: World Population Prospects: The 2006 Revision (United Nations, 2007)

Figure 5c: Old Dependency Ratio



Source: World Population Prospects: The 2006 Revision (United Nations, 2007)

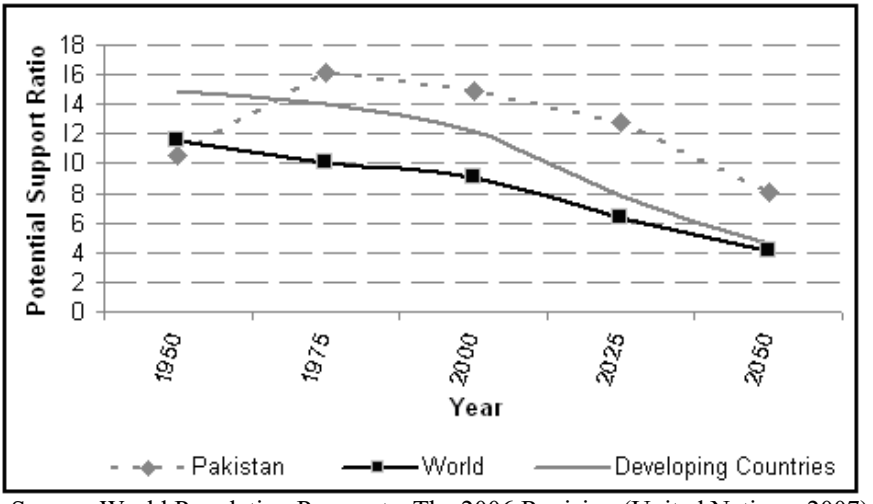
4.3 Potential Support Ratio

This ratio expresses the numerical relationship between those who are more likely to be economically productive and those who are more likely to be dependent (United Nations, 2002). In the year 1950, the number of people in the working age group, for every person of age 65 years or older, was 10.61 in Pakistan. This ratio started to rise and reached 16.5 in the mid-1980s. Later on, it started declining slowly, and in 2000, there were 14.94 persons in the working age group for every person 65 years of age or above. It is projected that by the year 2050, this ratio will reach 8.10 in Pakistan (Figure 6). If we compare this ratio with other countries of the world, Pakistan will be in a relatively better position by the year 2050 (Figure 6). In the year 2050, globally there will be 4.1 people in the working age to support one person of age 65 years or above. This ratio is expected to be 2.2 in developed countries, 4.6 in developing countries and 10.2 in the least developed countries, while in Europe, this ratio will be fewer than 2 (United Nations, 2002).

4.4 Ratio of Working Age to Dependents

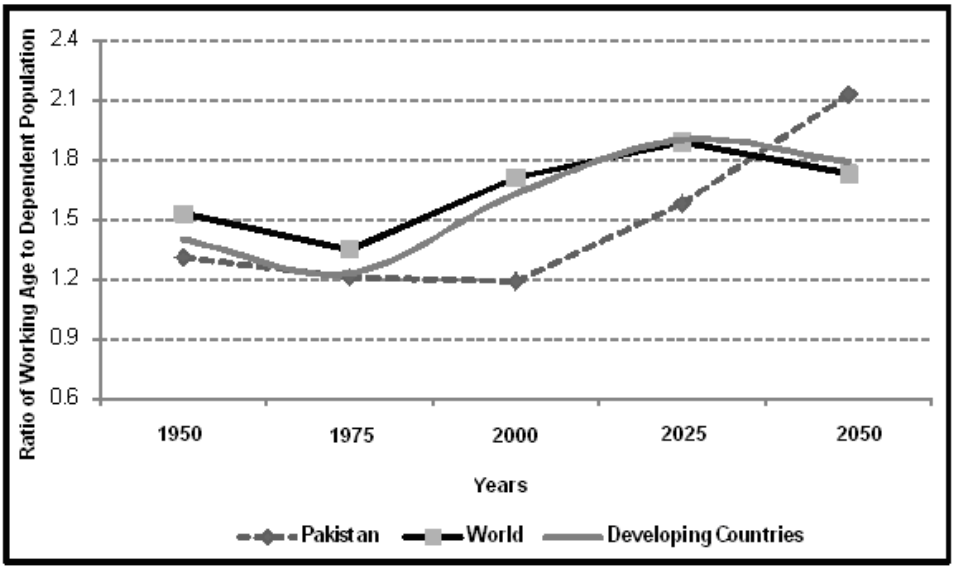
This ratio expresses the number of working age population (15-64 years) to dependent population (below 15 years and above 65 years of age). In 1950, in Pakistan, there were 1.31 people in the working age for one dependent person in the population. This ratio started to decline and in the year 2000, there were 1.19 persons in working age group for every dependent person in the population (a fall of 9.1 percent in the fifty years). For the next half century, this ratio is expected to increase significantly and will be 2.13 in 2050; about 44 percent increase in the coming 50 years (Figure 7). On the other hand, by the year 2050, globally, there will be 1.73 people in the working age group for one dependent person and in developing countries, the ratio of working age to dependents will be 1.79 (Figure7).

Figure 6: Potential Support Ratio



Source: World Population Prospects: The 2006 Revision (United Nations, 2007)

Figure 7: Ratio of Working Age Population to Dependent Population



Source: World Population Prospects: The 2006 Revision (United Nations, 2007)

4. Socio-Economic Implications of Changing Age Structure

This analysis shows that the population of Pakistan will be youthful in the coming half century. Having youthful population presents both potential risk and benefits for Pakistan. In future, demographic changes in Pakistan will increase the labor supply in two ways: first, an increase in the proportion of working age population will increase the overall labor supply in the economy; secondly, a decrease in fertility rate will potentially increase the women labor force participation rate. Since labor is one of the major factors of production, an increase in labor input would shift the production possibility frontier outwards, all else being equal. Increase in output implies a rise in income, which in turn will increase the potential of saving and investment in the country (Lee *et al.,* 2000).

However, it is not only the absolute number of people that matters; most important is the number of people contributing to the economy. Their contribution depends upon their productivity and participation in economic activities. At present, a significant number of people who are of

a working age are not a part of the labor force. Moreover, most of the labor force is not properly trained and skilled. For example, in Pakistan, youth constitutes a major proportion of working age population (25 million youth in the 18-25 years age group), but only 1.7 percent of them are contributing to national income by applying their education and training – i.e. economically active youth (Ministry of Finance, 2006-07).

Furthermore, female labor force participation rate is as low as 18.9 percent. On the other hand, those who participate in economic activities face enormous difficulties when they enter the labor market. Early start of work, lack of education and lack of skills and experience are some of the major issues of the youth in Pakistan's labor market. In Pakistan, many young people leave school early and enter the labor market, which adversely affects their productivity later in life. Early start of work is more common in poor households where people do not have enough resources to educate their children. For example, a study by Faizunnisa (2005) shows that 50 percent of young males in lowest income quintile start working before the age of 15, which results in fewer opportunities for earnings in life. Without addressing the issues of the labor market, it would be difficult to reap all the fruits of demographic changes.

Moreover, a youthful population will assert an upward pressure on house prices because house buying segment of population (20 years and above) has increased from 47 percent to 50 percent since 1980 and is expected to increase up to 72 percent by the year 2050. It may result in an increase of house rent in both urban and rural areas.

Large population of young people presents a great potential for foreign direct investment, especially in the telecom industry, but foreign direct investment requires political stability and good law and order conditions in the country. By providing an investment friendly climate, Pakistan can be a great market for future investment opportunities.

In the future, Pakistan can take advantage of demographic changes that are taking place in the developed world by exporting its surplus skilled labor. Future ageing trends in developed countries and a rising trend of working age population in countries like Pakistan creates a potential

benefit of exporting its surplus labor to countries facing the problem of ageing population.

Having youthful population has many social implications as well. In general, young people are more energetic, mobile and flexible which might be an asset when major demographic changes occur in the population. They can easily migrate in search of jobs and for better pay. Young people also provide a good investment climate and help the country attract foreign direct investment. They are more able to learn new techniques of production. Large share of youthful population means, in future, government has to invest more in education sector to meet the growing needs of the young population. Young people can also play an important role in society owing to their being more receptive to new ideas, cultural changes and the like.

Falling dependency ratio and increasing working age to dependent population ratio may play a major role in raising the standards of living. Greater the ratio of working age-to-dependants population, the easier it will be for the government to support a dependent population. Consequently, youthful population could be a boon for a country if it is used productively to enhance the production and national income of that country. At the same time, it could be a bane if proper employment and educational opportunities are not provided to them. Without addressing the issues of poor schooling, early start of work, low labor force participation rate, lack of skills and training, it will be difficult to materialize its potential labor force in the demographic dividend.

5. Conclusion and Recommendations

In this rapidly graying world, Pakistan will be having a youthful population until 2050. Age structure of Pakistan in the coming half century will be such that a majority of the population will be of primary working age, dependency rate will fall leading to improvement in ratio of working age to dependant population. It will improve the country's overall potential for saving and investment because dependent population saves less compared to the working age population. It is high time for Pakistan to formalize such policies that can turn this youthful population

into a productive labor force. By providing technical know-how, adequate skills and better education, Pakistan can progress not only economically, but also socially, because young people tend to be more energetic, mobile and flexible. However, if this young segment of population remains unskilled or uneducated, a great opportunity will be lost, which might not come again. Proper education and skill will not only ensure their contribution within the country, but also in the global village, as many developed countries would need young, energetic and skilled workers in the coming half century due to their rapidly ageing population. For this purpose, Pakistan should support the policies of globalization to foster economic growth and export surplus labor. Moreover, investment in human capital can increase the productivity of labor force in the future, which is a key determinant of economic growth.

Currently, female labor force participation rate in Pakistan is very low. By providing proper facilities and a better environment, the government can promote female labor force participation rate in future which can be a boost for economic growth in Pakistan.

In the end, process of demographic transition in the world provides a lesson for a country like Pakistan. The process seems to be irreversible or, at least, requires a long time to enter from one phase into another. Once it gains momentum, it becomes very difficult to control or alter it. It requires long term and careful planning to ensure maximum dividends during the phase of a high proportion of youthful population and to avoid the problem of an ageing population afterwards for a country like Pakistan.

References

Arif, G. M. and N. Chaudhry 2008. "Demographic transition and youth employment in Pakistan" *Pakistan Development Review* 47: 27-70.

Bloom, D., D. Canning and J. Sevilla 2001. "Economic growth and demographic transition" Working Paper No.8685. Cambridge, MA: NBER.

Bloom, D., D. Canning and J. Sevilla 2003. "Demographic dividend: A new perspective on the economic consequences of population change" Santa Monica, CA: RAND Corporation.

Bloom, D.E. and J.G.Williamson 1998. "Demographic transitions and economic miracles in emerging Asia" *World Bank Economic Review* 12(3): 419-456.

Faizunnisa, A. 2005. "The poverty trap: Leveling the playing field for young people" Islamabad: Population Council.

Horlacher. D. E. and L. Mackellar 2003. "Population ageing in Japan: Policy lessons for South East Asia" *Asia-Pacific Development Journal* 10(1): 97-122.

Jackson, N. and B. Felmingham 2003. "The demographic gift in Australia" Discussion Paper, 2003-03. Tasmania, Australia: School of Economics, University of Tasmania available from http://www.utas.edu.au/economics

Kinsella, K. and Y.J. Gist 1995. "Older Workers, Retirement, and Pensions: A Comparative International Chartbook" Washington, D. C.: United States Bureau of the Census (IPC/95-2RP).

Lee, R., S. Hyope and A. Mason 2006. "Charting the economic life cycle" Working Paper No. 12379. Cambridge, MA: NBER.

Lee, R., A. Mason, and T. Miller 2000. "Life cycle saving and the demographic transition: The case of Taiwan" *Population and Development Review* 26 (Supplement): 194-219.

Mason, A. 2001. "Population change and economic development in Eastern and South-eastern Asia: Challenges met, opportunities seized" Stanford, CA: Stanford University Press.

Ministry of Finance, 2006-07. *Pakistan Economic Survey*. Islamabad: Printing Corporation of Pakistan (Pvt.) Ltd.

Nayab, D. 2008. "Demographic dividend or demographic threat in Pakistan" *The Pakistan Development Review* 47: 1-26.

Ross, J. 2004. *Understanding the demographic dividend*. Washington, DC: Policy Project

United Nations 2002. Department of Economics and Social Affairs, Population Division. *World population ageing: 1950-2050*. New York: UNO.

United Nations 2004. Department of Economics and Social Affairs, Population Division. *World population monitoring, 2003: Population education and development*. New York: UNO.

United Nations 2007. Department of Economics and Social Affairs, Population Division. *World population prospects: The 2006 revision* [Dataset]. New York: UNO.

Export-Led Growth, Growth-Led Export: Both or None?
Granger Causality Analysis on Pakistan

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Abstract: This study examines the direction of causation between export growth and economic growth of Pakistan, using both Granger Causality Analysis as a direct approach and Amended Granger Causality Analysis as an indirect approach by using time series data from 1970-71 to 2007-08. The stationarity and co-integrating properties of all the variables are satisfied. The empirical results suggest a long-run relationship between exports and economic growth in Pakistan along with a direction of causality running from exports growth to economic growth in 80 percent of the cases. Though export growth causes economic growth, the converse is not true in most cases (60 percent).

Keywords: Stationarity, Economic Growth
JEL Classification: O14

1. Introduction

The idea of international trade being the engine of growth is as old as rocks. Its recorded history can be traced back to Classical Mercantilists. However, during the 20th century, the idea lost its popularity to some extent. The dominance of protectionist theories in the policy making of a majority of developing countries saw the implementation of industrialization policies based on a very limited degree of openness known as "Import Substitution Industrialization (ISI)" strategies, which had their origin in the thinking of Prebisch (1950) and Singer (1950).

During the 1950's, 1960's and 1970's a large number of development economists embraced the protectionist view, and devoted enormous energy in designing and planning models that relied heavily on import substitution ideas. The policy of industrialization through import substitution generally met with limited success. But growth oriented strategies based on import substitution had their own drawbacks i.e, their

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implementation in many countries failed to address major problems like low income earnings, unemployment and poverty (UNIDO, 1991). Therefore, emphasis was laid on sectoral restructuring and policy redesigning. In early 80's, many countries that earlier followed an ISI began to liberalize trade and adopted EOI.[15] Furthermore, the debt crises of 1982 also played an important role in reshaping policy views.

The empirical evidence in favor of export promotion is based on the general approach where real growth is regressed on real export growth. A significant export growth coefficient supported the hypothesis of Export-led growth. Balassa (1978), Fosu (1990), Bahmani-Oskooee and Alse (1993), Love (1994) and many others have applied this approach by utilizing data worldwide. Quddus and Saeed (2005) have found a positive Granger Causal relationship running from exports to economic growth for the long-run period in Pakistan from 1970-71 to 2003-04.

The purpose of this study is to examine the direction of causation between exports growth and economic growth in Pakistan, using a direct Granger Causality approach, and an indirect approach of Amended Granger Causality test along with taking into consideration the non-stationarity as well as the co-integrating properties of all the series used in the study. This study uses the annual time-series data covering the period 1970 to 2008. Section II reviews literature by including the theoretical and empirical findings from past studies on Export-Led Growth Hypothesis. Section III describes research methodology along with data sources and construction of variables. Section IV explains the estimated results. Finally, section V summarizes the study's findings and section VI gives the limitations and new avenues for further research.

2. Literature Review

The role of trade in achieving a sustainable rate of economic growth has been extensively discussed in literature, emphasizing the role of different economic variables, such as degree of openness, real exchange

[15] Hong Kong, Korea and Singapore followed Export-Oriented Industrialization in early 1950s, while Korea followed ISI with EOI.

rate, tariffs, terms of trade and export performance, in order to support the hypothesis that open economies grow more rapidly as compared to closed economies (Edwards, 1998). The proponents of free trade and export-led growth relate the poor economic performance of developing countries in Latin America to the inward-oriented policies based on ISI (Balassa, 1980).

Afterwards, many LDCs followed an export-led strategy based on trade liberalization policies; consequently, empirical researches have tried to empirically test the relationship between exports growth and economic growth leading to different results for developed and developing countries for different time periods under consideration.

Generally, the empirical studies regarding the relationship between exports and output growth can be divided into three categories. The first group of studies used cross-country correlation coefficients to test the ELG hypothesis, second includes the cross-country regression applications based on least squares and the third group applied various time series techniques to examine the relationship of export growth and economic growth. All the three categories are described briefly in the following sub-sections, along with the studies relating to Pakistan's export contribution towards economic growth.

2.1 Cross-Sectional Studies Based on Correlation Coefficients

In this category, the researchers used rank correlation coefficients or simple OLS regressions to describe the relationship between exports and output. The number of countries in their samples varied from seven to more than one hundred for various time periods and employed different definitions of export and economic growth variables to test the relationship between exports and economic growth. The ELG hypothesis is supported when a positive and statistically significant correlation is observed. The general conclusion observed was that high levels of economic growth are significantly and positively correlated with high levels of export growth.[16]

[16] Balassa (1978), Bhagwati (1988), Rana (1985), Tyler (1981) and others, used Spearman's Rank Correlations Test to explore the relationship between exports growth and economic growth.

2.2 Cross-Sectional Studies Based On Simple OLS Estimation

Studies including Balassa (1980), Ram (1985) and Fosu (1990) investigated exports and growth performance within a neoclassical framework by applying ordinary least squares (OLS) technique on cross sectional data and found that export is an important factor to accelerate economic growth.

Studies that do not support ELG include Papanek (1973), Sprout and Weaver (1993) and others. Even though it is difficult to point out the reasons for rejecting exports contribution towards economic growth as compared to other studies, different country sets, time periods chosen and choice of variable definitions were found to be three prominent factors for contrasting results.

One of the limitations of the cross sectional study is that it assumes the consistency of regression parameters across all sample countries.[17] Many of the cross country studies also used averaged growth rates leading to mis-specifications and parameter instabilities (McDonald and Roberts, 1996), as they ignored the changes that have occurred over time for the same country in the same time period.

2.3 Time Series Studies

With recent econometric advancements, emphasis has shifted to the application of time series analyses in order to determine the relationship between exports and economic growth along with the direction of causality.

Studies providing supportive empirical results for ELG include Arnade and Vasavada (1995) and Fosu (1996), while others who found contrasting evidence that export is Granger caused by economic growth include Henriques and Sadorsky (1996). Still others demonstrated that there exists

[17] Differences in production functions, the degree of factor differentiation between factor productivities in different sectors along with institutional, political, financial structures are very important even if the chosen sample belongs to the same income group (Feder ,1983).

a bidirectional relationship between these variables (Dutt and Ghosh, 1994).

Another strand of literature on the export-led growth hypothesis argues that the studies employing standard Granger or Sims causality tests may be misleading, owing to the fact that these tests have not incorporated the stationarity properties of the variables under consideration. To overcome this problem, recent studies on the export-led growth hypothesis have adopted the approach of Error Correction Modeling (ECM) (Marin, 1992).

Among time series data analysis, many researchers have utilized the Granger No-Causality testing procedure. However, one problem with these studies is their choice of arbitrary lag length (Jung and Marshall, 1985). Moreover the use of F-test statistics for the causality test is found to be inappropriate (Marin, 1992). The causality tests are found to be sensitive as far as model specification and functional form is concerned. If the functional form does not include relevant variables, it may reveal mis-specified causality impacts (Gujarati, 1995).

Another problem that has not been properly investigated is that exports through the national income accounting system are an important component of output.[18] To overcome this problem, Feder's (1983) approach can be utilized i.e. the economy can be divided into export and non-export sectors and economic growth netted of export growth can be utilized in the analysis.

2.4 Pakistan's Perspective

The initial work to investigate the relationship between export growth and economic growth started in the early eighties in Pakistan. To the authors' knowledge, the first well-known study published in this decade as far as Pakistan is concerned was of Jung and Marshall (1985); afterwards, Rana (1985) and Ram (1985) contributed in this respect. Much work on export-led growth in Pakistan was done in the nineties and later on, at the start of the twenty-first century. It involved the work of Salvatore and Hatcher

[18] See Feder (1983) and Love (1994)

(1991) and Kugler and Dridi (1993), yielding different results in case of Pakistan.

On the other hand, Khan and Saqib (1993) found a strong relationship between export performance and economic growth in Pakistan. Bahmani-Oskooee and Alse (1993) concluded that bidirectional causality between the export variable and the economic growth variable is found in Pakistan.

Anwar and Sampath (2000) found unidirectional causality in the case of Pakistan while Akbar and Naqvi (2000) showed that the exports do not lead growth in any of the Granger Causality tests. Kemal *et al.* (2002) investigated export-led hypothesis for five South Asian countries, including Pakistan, and found no evidence of causation in the short run for Pakistan in either direction.

In a recent multivariate study comprising India, Pakistan and Sri Lanka, Love and Chandra (2004) found evidence of bidirectional causality between real exports and real income in India, export-led growth in Pakistan and a no-causality result for Sri Lanka. Also, Shirazi and Manap (2004) found a strong long-run relationship among imports, exports, and output growth employing the co-integration and multivariate Granger Causality Test (Toda and Yamamoto, 1995).

Shirazi and Manap (2005) found unidirectional causality running from export to output growth. In contrast, Kemal and Qadir (2005) analyzed the long term relationship and the short term dynamics between the three variables (exports, imports and real exchange rate) and concluded that there existed a long run relationship between real exchange rate, exports, and imports. Real exchange rate was found to be negatively associated with exports and positively associated with imports.

3. Data Analysis, Model Estimation and Evaluation

3.1 Data Analysis

Data used in the study has been taken from the Handbook of Statistics on Pakistan Economy (2005). Data for the year 2005-08 is taken from

different issues of the Economic Survey of Pakistan (GoP, 2005, 2006, 2007, 2008).

The data regarding all the fifteen variables used in the study ranges from 1970-71 to 2007-08. All the data except employment ratio and exchange rate are based on current prices. For the empirical analysis, all the series except employment ratio are deflated by GDP deflator to obtain data in the real sense. Then, all the series were transformed into respective logarithms.

The present study examines the direction of causation between export growth and economic growth in Pakistan, using as a direct approach, Granger Causality, and as an indirect approach, Amended Granger Causality test and it takes into account the non-stationarity as well as the co-integrating properties of all the series used in the study.

3.2 Steps Involved in Data Analysis

Five models are estimated based on the limitations of studies presented in the section of literature review. These are:

3.2.1 Bivariate Model

In this model the relationship between real exports and real GDP is determined.

3.2.2 Bivariate Model (Excluding Exports)

It is argued that if exports are a substantial component of GDP, it can lead to the possibility of built-in correlation between GDP and exports (Heller and Porter, 1978). This criticism can be dealt with by testing the causality between exports and GDP netted for exports (Chandra, 2002). This can be done by taking GDP and exports data in current prices and the difference among these can then be deflated by the GDP deflator to arrive at real GDP, net of exports.

3.2.3 Trivariate Model

As discussed in the literature review, bivariate export-growth models may be mis-specified as besides exports other important variables such as

imports are not included.[19] Accordingly, total real imports are included as a third variable in this step (Serletis, 1992).

3.2.4 Four Variate Model

Following Alam (2003), who argues that capital goods imports are also considered to boost export growth and productivity, the present study has tested the ELG hypothesis while dividing total imports into imports of capital goods and consumer goods to capture the role of these two categories in establishing the relationship between exports and economic growth.

3.2.5 Multivariate Model

With the combination of the production function, international trade and development theories, a six variable (economic growth, exports, imports, gross domestic capital formation, employed labour force as a ratio of total population and exchange rate), Vector Autoregression (VAR) model has been developed (Riezman *et al*., 1996).

3.3 Model Estimation

After giving a brief description of the models employed in the analysis, steps involved in the process of model estimation are described as:

3.3.1 Inspection of Graphs

First, all the real time series are transformed into logarithms. Logarithmic plot of the variables of the model under consideration is observed to determine whether the variables under consideration have a tendency to move together or not (Shirazi and Manap, 2005).

3.3.2 Order of Integration

Before testing for co-integration, the unit roots are tested in order to investigate the stationarity properties of the data. Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) t-test (1979) and Phillips and Perron

[19] Caporale, Hassapis, and Pittis (1998) showed that the non-inclusion of an important variable could lead to invalid inferences about the direction of causation of the system.

(PP) (1988) test are used on each of the time series involved in the model under consideration to determine the presence of a unit root (Shirazi and Manap, 2005). The lag length for the ADF and PP tests was selected equal to 1 to ensure that the residuals were white noise.

3.3.3 Testing for Co-integration

After considering the stationarity properties of all the variables, test for co-integration between the variables on levels is conducted.[20] Before the Johansen (1991) procedure is formally employed to test co-integration, the Engle-Granger test and CRDW test (Sargan and Bhargava, 1983) test is used initially to examine the existence of a long-run relationship among the variables of interest. This is just a complementary test.

3.3.3.1 The EG and CRDW Test

In this section, the Engle-Granger test and CRDW test (Sargan and Bhargava, 1983) are used to investigate the co-integration status of the model under consideration. In doing so, equation (1) is estimated at levels through OLS and the stationarity properties of residuals from the regression are examined:

$$Y_0 = \beta_0 + \sum_{i=2}^{j=8} Y_i + \varepsilon_i \qquad (1)$$

where Y_i ranged from Y_2 to Y_8 depending upon the selection of variables in the relevant model. After estimating the above regression for each model, Adjusted R^2 and CRDW are computed. If Durban-Watson d statistic is less than the Adjusted R^2, the model is not a good fit. Granger and Newbold (1974) have suggested an $R^2>d$ is a good rule of thumb to suspect that the estimated regressions suffer from spurious regression. If CRDW exceeds the critical value, it is in a position to reject the null

[20] Two time series are said to be co-integrated when a linear combination of the concerned time series is stationary, even though each series may individually be non-stationary. Since non-stationary time series do not return to their long-run average values following a disturbance, it is important to convert them to stationary processes, otherwise regressing one non-stationary process on another non-stationary process can generate spurious results.

hypothesis that the variables are not co-integrated. Then, Engle-Granger (EG) or Augmented Engle-Granger (AEG) tests are applied to check out the stationarity properties of residuals obtained from above regression. If the EG Co-integration test also rejects the null hypothesis at the 1 percent significance level, the residuals estimated suggest that the variables involved in the model have a tendency to move together in the long run from the 1970 to 2008 period.

Although both CRDW and the EG procedures have distinct advantages and positive results, both tests also have several important defects. Thus, before making any kind of judgment, a more powerful test, Johansen Maximum Likelihood Techniques, is employed to verify the existence of co-integration in the following step.

3.3.3.2 Johansen Maximum Likelihood Techniques

The selection of the lag length *k* of the vector autoregressive (VAR) model is an important step in empirical estimations of Johansen ML procedure (Kokko, 2002). Akaike Information Criterion (AIC), Schwarz Criterion (SC) and Log Likelihood can be used to select the lag length of the VAR system, by minimizing the AIC and SBC and maximizing Log Likelihood. If all three cases concur in suggesting the use of a VAR with a same lag order, that lag length will be utilized in the analysis.

Reinsel and Sung (1992) argued that in a model with a limited number of observations, the likelihood ratio tests can be biased towards finding co-integration too often. Thus, they suggest multiplying the LR test statistics (λ-max and trace) by a factor *(T-nk)/T*, where *T* is the effective number of observations, *n* is the number of variables in the model, and *k* is the order of VAR, to obtain the adjusted estimates; the same adjustment is applied to all models.

If all of above tests confirm co-integration among the variables under study, then multivariate Granger Causality developed by Toda and Yamamoto (1995) is utilized to study short-run dynamics among variables under consideration.

3.3.4 Multivariate Granger Causality Test

Toda and Yamamoto (1995) have proposed a simple procedure for the estimation of an Augmented VAR, which is applicable irrespective of the integration or co-integration properties of the system. The Toda and Yamamoto (1995) procedure utilizes Modified Wald *(M WALD)* test to test the restrictions on the parameters of the *VAR (k)* model. This test has an asymptotic chi-squared distribution with k degrees of freedom in the limit when a *VAR [k+d(max)]* is estimated.[21] Two steps are involved in the implementation of the procedure. The first one involves determination of true lag length*(k)* and the maximal order of integration*(d)* of the variables in the system. Given the *VAR(k)* selected, and the order of integration *d (max)* is determined, a level *VAR (k)* can be estimated; the second step is to apply the standard Wald tests to first *k VAR* coefficient matrix to conduct inference on Granger Causality. All the steps described above are the parts of a direct approach to determine the relationship between exports and total GDP.

3.3.5. Indirect Approach

In the indirect approach, after establishing the fact that the two variables are co-integrated as in the step 3.3.3.1, the question as to which variable causes the other can be estimated. In this connection, the standard Granger causality is amended to incorporate the error correction terms, which are derived from the co-integrating regressions in each model (Khan *et al.*, 2000). The amended Granger causality test is given as follows:

$$(1-L)X_t = a_0 + b_0\mu_{t-1} + \sum_{i-1}^{m} C_{0i}(1-L)X_{t-i} + \sum_{i-1}^{n} d_{oi}(1-L)Y_{t-i} + e_i \qquad (2)$$

$$(1-L)Y_t = a_0 + b_1\mu'_{t-1} + \sum_{i-1}^{m} C_{1i}(1-L)Y_{t-i} + \sum_{i-1}^{n} d_{1i}(1-L)X_{t-i} + e'_i \qquad (3)$$

where L is the lag operator and the error correction terms μ and μ' are the stationary residuals from the co-integrating equations derived in each

[21] *d(max)* is the maximum order of integration for the series in the system.

model. By introducing error-correction terms in the above equations, an additional channel is available through which causality can be tested. For example, in equation (2), Y is said to be Granger-X either when the coefficients of lagged Y are positive and jointly significant through the F-test or if one is significant or both (Love and Chandra, 2005). Thus, error-correction models allow for the fact that causality can be evident either through the lagged changes of the independent variable or through the error-correction term or through both. In the above mentioned analysis, it is important to distinguish between short-term and long-term causality (Bahmani-Oskooee and Alse, 1993).

4. Estimation of All Models

Plots of the logarithms of all five models are shown in Figures 1,2,3,4 and 5, respectively, providing anecdotal evidence that the variables included in all five models have a tendency to move together in the long run except in the multivariate model, where the time series log of labor force (measured as ratio of total population) "Y_5" and log of real exchange rate (measured as Rs./US$) "$Y_6$" exhibit upward trend but not as strong as in the other four series. Thus, a graphical inspection of all the five models shows a positive upward trend in all the observed time series.

In the level form, the results computed from DF, ADF and PP are mixed and as such nothing definite can be said about the stationarity properties of the variables of all the five models. However, DF, ADF and PP test statistics reject the null hypothesis of non- stationarity for all the variables under all the five models to be used in the amended Granger Causality test, only when the first differenced variables are used as an indirect approach and in Multivariate Granger Causality test (TY Augmented Lags Methods) as a direct approach [Table (A)].

Before turning to the empirical estimations, we had to determine the lag *k* of the vector autoregressive (VAR) model in levels, which is a critical stage of the Johansen ML procedure. The literature recommends the use of the Akaike Information Criterion (AIC), Schwarz Criterion (SC) and Log Likelihood to select the lag length of the VAR system, which is achieved

by minimizing the AIC, and SC and maximizing Log Likelihood. The lag lengths selected for all the five models are give in Table (C).

The null hypothesis of no co-integration is rejected using both the Trace Statistics and Eigen Values because both statistics are greater than their critical values. However, the null hypothesis of at most one co-integrating vector cannot be rejected in favor of r =2. Thus, the empirical support for one co-integration vector implies that the variables included in all five models are co-integrated and follow a common long-run path.

The first four steps of investigation yielded same results for all the models under consideration. The remaining steps gave a different result; that's why they are elaborated separately.

4.1 Bivariate Model

The estimated ADF statistics in both the co-integrating regressions (-4.515 and -4.219, respectively) are less than the corresponding 95 percent critical values (-3.533), indicating that real exports and real GDP are co-integrated. This is further confirmed by the results of Co-integrating Regression Durbin-Watson (CRDW) statistics, where in both the cases (0.755 and 0.746, respectively) the CRDW statistic is greater than its 95 percent critical value (0.78). The signs of the slope coefficients are found to be positive in both cases, indicating that the relationship between real exports and real GDP is positive.

There are two ways in which causality can express itself: through the F-test of joint significance of the lagged differenced terms, and through the error-correction term. The results are reported in Table 1(e). It can be seen that in the first case the F-statistic (0.523) for $Z_0 \rightarrow Z_2$ is insignificant at 95 level of confidence and in the converse case (2.918) $Z_2 \rightarrow Z_0$ is significant at 90 percent level of confidence. Thus, the data suggest that there is no short-term causality in first case but exists in the other case. If one looks at the error-correction terms, they appear insignificant in both cases (0.85 and 2.55, respectively), implying that real exports and real GDP do not exhibit co-integration or a long-term relationship in either direction.

Table 1(f) shows that the null hypothesis that 'Granger no-causality from export to growth' can be rejected at 1 percent level of significance. However, there is no evidence to support the converse.[22] This indicates that there is a unidirectional causality running from exports to output growth. This confirms the ELG hypothesis for Pakistan.

4.2 Bivariate Model (Excluding Exports)

The estimated ADF statistics in both the co-integrating regressions are less than the corresponding 95 percent critical values indicating that real exports and real GDP excluding exports are co-integrated[23], confirmed by Cointegrating Regression Durbin-Watson (CRDW) statistics.[24] Table 2(b) also shows that the slope coefficients of the co-integrating regressions are positive in both cases, indicating that the relationship between real exports and real GDP is positive.

Causality can be expressed both through the F-test of joint significance of the lagged differenced terms or through the error-correction term [Table 2(e)]. In the first case, the F-statistics for $Z_1 \rightarrow Z_2$ is insignificant at 95 level of confidence and in the converse case, $Z_2 \rightarrow Z_1$, is significant at 90 percent level of confidence. Thus, the data suggest that there is no short-term causality, in the first case, but exists in other case. If one looks at the error-correction terms, they appear significant in equation (2) [Table 2(e)], implying that the direction of long-term causality runs only in one direction from growth of real total exports to growth of real GDP.

Table 2(f) shows that the null hypothesis that 'Granger no-causality from export to growth' can be rejected at 5 percent level of significance. However, there is no evidence to support the converse.[25] This indicates

[22] F-statistics of 9.802 with a probability of 0.02 of being insignificant in first case and in the second one F- statistic of 0.820 with the probability of 0.845 of being significant.

[23] ADF test statistic is -4.235 in first case and is -4.109 in second case; both are less than 95 percent critical value for ADF (-3.533).

[24] CRDW test statistic is 0.75 in first case and is 0.744 in second case; both are greater than 90 percent critical value for CRDW (0.69).

[25] F-statistic of 10.289 with a probability of 0.016 of being insignificant in the first case and a F-statistic of 3.744 with a probability of 0.290 of being insignificant in second case [Table 2(f)].

that there is a unidirectional causality running from exports to output growth. This confirms the ELG hypothesis for Pakistan even excluding total exports from GDP.

4.3 Trivariate Model

From Table 3(b) it may be seen that the estimated ADF statistics in the first co-integrating regression are greater than the corresponding 95 percent critical values, indicating that real exports, real imports and real GDP excluding exports are not co-integrated, while in the second case there exists long run co-integration among these three variables.[26]
It can be seen that in the first case, the F-statistics for $Z_1 \rightarrow Z_2$ in the presence of Z_3 is insignificant at 95 percent level of confidence and in the converse case $Z_2 \rightarrow Z_1[Z_3]$ is significant at 95 percent level of confidence. Thus, the data suggest that there is no short-term causality in the first case, but exists in other case. If one looks at the error-correction terms, they appear significant in equation (1) [Table 3(e)], implying that the direction of long-term causality runs only in one direction from growth of real GDP (netted of total exports) to growth of total exports.

Table 3(f) shows that the null hypothesis that 'Granger no-causality from export to growth' can be rejected at 5 percent level of significance. However, there is no evidence to support the converse.[27] This indicates that there is a unidirectional causality running from exports to output growth. This confirms the ELG hypothesis for Pakistan even excluding total exports from GDP and including total imports as a second explanatory variable.

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[26] ADF test statistic is -2.1231 in first case is greater than 95 percent critical value for ADF (-3.533) and is -12.32 in second case which is less than 95 percent critical value for ADF (-3.533).CRDW test statistic is 0.425 in first case which is less than 95 percent critical value of CRDW (0.78) and is 0.8 in second case which is greater than 95 percent critical value for CRDW (0.78).

[27] F-statistic of 9.78 with a probability of 0.021 of being insignificant in the first case and F-statistic of 0.486 with a probability of 0.922 of being insignificant in second case [Table 3(f)].

4.4 Four Variate Model

The estimated ADF statistics in the first co-integrating regression are greater than the corresponding 95 percent critical values, indicating that real exports, real imports of capital goods, imports of consumer goods and real GDP excluding exports are not co-integrated (-1.949 > -3.533) , while in the second case there exists long run co-integration among these four variables (-4.521 < -3.533) . This is further confirmed by Co-integrating Regression Durbin-Watson (CRDW) statistics where the value of CRDW is much greater than the 95 percent critical value [Table 4(b)].

Short-term causal relationship can be represented through the F- test of joint significance of the lagged differenced terms, and the long-term causality can be expressed through the significance of the error correction term [Table 4(e)].

In the first case, the F-statistic for $Z_1 \rightarrow Z_2$ in the presence of Z_7 and Z_8 is insignificant at 95 percent level of confidence and in converse case $Z_2 \rightarrow Z_1[Z_7,Z_8]$ is also insignificant at 95 percent level of confidence [Table 4(e)]. Thus, the data suggest that there is no short-term causality in both cases. If one looks at the error-correction terms, they appear significant in equation (1) [Table 4(e)], implying that the direction of long-term causality runs only in one direction from growth of real GDP (netted of total exports) to growth of Total exports, in the presence of imports of capital goods and consumer goods.

The null hypothesis that 'Granger no-causality from export to growth' can be rejected at 5 percent level of significance. However, there is no evidence to support the converse. This indicates that there is a unidirectional causality running from exports to output growth in the presence of imports of capital goods and consumer goods. Z_7 and Z_8 are also proved to be significant at 95 percent and 90 percent, respectively, showing the short-term causality from these variables to total imports [Table 4(f)]. This confirms the ELG hypothesis for Pakistan, even excluding total exports from GDP, including total capital imports and total consumer goods imports as second and third explanatory variables.

4.5 Multivariate Model

The estimated ADF statistics in both co-integrating regressions are less than the corresponding 95 percent critical values indicating that real exports, real imports, real GDP, employment rate, real exchange rate and real GDP excluding primary exports are co-integrated [Table 5(b)]. This confirms the findings of Co-integrating Regression Durbin-Watson (CRDW) statistics, where the values of CRDW are well above the 95 percent critical value in both cases, indicating a long run relationship between all the six variables.[28]

The F-statistics for $Z_1 \rightarrow Z_2$ in the presence of Z_3, Z_4, Z_5 and Z_6 is insignificant at 95 percent level of confidence and also in the opposite case. Thus, the data suggest that there does not exist short-term causality in either case. In both cases, the F-statistics of dependent variables are proved to be insignificant at 95 percent level of significance. In the second case, Z_3 is proved to be significant at 90 percent level of confidence showing short-term causality from total imports and GDP (excluding exports). If one looks at the error-correction terms, they appear insignificant in both equations [Table 5(e)], implying that the direction of long-term causality does not run from growth of real GDP (netted of total exports) to growth of total exports in the presence of total imports, real GDP, employment rate, real exchange rate and even in the other direction.

The null hypothesis of 'Granger no-causality from exports to growth' cannot be rejected at 10 percent level of significance in either case indicating that there is no unidirectional causality running from exports to output growth and vice versa. This rejects the ELG hypothesis for Pakistan excluding total exports from GDP and including total imports, real GDP, employment rate and real exchange rate as second, third, fourth and fifth explanatory variables along with total exports.

[28] ADF test statistic is -3.967 in first case and is greater than 95 percent critical value for ADF (-3.533) and is -3.56 in second case which is also greater than 95 percent critical value for ADF (-3.533). CRDW test statistic is 0.958 and 1.989 which is greater than 95 percent critical value for CRDW (0.78).

5. Conclusion

The purpose of this study was to investigate the direction of causation between export growth to economic growth and vise versa in case of Pakistan. This issue has been widely investigated in the past in the context of the comparison of export promotion versus import substitution as development strategies. In the 1950's and 1960's, most of the developing countries followed Import Substitution (IS) policies as a development strategy. Since the mid-1970s, in most developing countries, there has been a considerable shift towards Export Promotion strategies (EP) emphasizing that the export expansion leads to better utilization of resources, economies of scale and enhancing productivity through technological advancement, formation of capital, and employment generation leading to a collective contribution towards economic growth. The issue of exports contribution towards economic growth has been the focus of economic debate yielding contradictory results. Moreover, findings of recent studies, which are conducted with reference to Pakistan, also give different results depending upon the choice of time period, explanatory variables besides exports and concepts utilized in the studies.

This study has tried to re-investigate the export-led growth hypothesis by accommodating the entire possible shortcomings discussed in the literature review. A Vector Autoregression (VAR) model based on the multivariate Granger Causality procedure, developed by Toda and Yamamoto (1995), along with the traditional error correction mode (ECM) have been employed to improve the standard F-statistics in the causality test process and to test the causal link between export growth and real output growth in Pakistan over the period 1970 to 2008.

The empirical results strongly support a long-run relationship among the export and economic growth variables. ELG proved to be significant in 4 out of 5 cases (80 percent), while GLE was found to be significant in 2 out of 5 cases in the presence of ELG leading to a case of bi-directional causality (40 percent), whereas in one case neither ELG nor GLE was found establishing no causal relationship between export growth and economic growth (20 percent). While reverse causation was found in one

case (5 percent), bidirectional causality was valid in 40 percent of the cases.

It is a fact that in the process of growth, imports play an important role through different channels. Exports boost the growth of economy through access to the world wide market and, hence, the economies of scale. It earns foreign exchange and also supports the employment in the export sectors of the economy. Pakistan may continue with the imports of necessary raw material for value addition and necessary technology to expand capacity and improve productivity and give full attention to boost up the exports.

Table (A): Results of the Unit Root Tests
Table 1(a)

Variable	DF		ADF		PP	
	Constant No trend	Constant trend	Constant no trend	Constant trend	Constant no trend	Constant trend
Data Period :1971 – 2008						
Y_0	-0.902	-2.235	-1.474	-2.627	-0.954	-2.200
Y_1	-0.477	-2.243	-0.944	-2.596	-0.481	-2.307
Y_2	-2.601	-5.262***	-1.617	-5.571***	-2.510	-5.280***
Y_3	-1.978	-3.193	-2.710*	-7.297***	-1.970	-3.233*
Y_4	-0.837	-1.981	-1.342	-3.164	-0.815	-2.093
Y_5	-2.041	-2.206	-2.033	-1.614	-1.965	-2.077
Y_6	-1.342	-2.703	-1.093	-2.580	-1.359	-2.777
Y_7	-0.725	-2.185	-1.708	-3.972**	-0.724	-2.203
Y_8	-2.981**	-4.438***	-2.647*	-8.697***	-2.864*	-4.635***
Panel B: First Panel Difference (uniform lag length = 1(ADF,PP) 0 for (DF))						
Y_0	-6.422***	-6.627***	-3.811***	-4.168**	-6.427***	-6.653***
Y_1	-5.952***	-5.960***	-4.387***	-4.626***	-5.965***	-5.983***
Y_2	-5.113***	-5.251***	-8.968***	-8.605***	-5.140***	-5.254***
Y_3	-4.903***	-5.352***	-4.323***	-3.680***	-4.984***	-5.421***
Y_4	-4.661***	-4.757***	-4.154***	-4.540***	-4.649***	-4.729***
Y_5	-7.392***	-7.592***	-5.653***	-5.610***	-7.397***	-7.586***
Y_6	-6.050***	-6.044***	-6.583***	-6.343***	-6.080***	-6.062***
Y_7	-5.828***	-5.940***	-3.866***	-3.729***	-5.816***	-5.915***
Y_8	-4.056***	-4.386***	-5.428***	-4.538***	-4.045***	-4.443***

Table (B): Results for the Test for Co-integration

Table 1(b)

Co-integration Equation	Slope	t-statistics of slope	Adjusted R^2	CRDW	ADF	95% Critical Value for ADF
$Y_2=f(Y_0)$	1.114	47.707	0.985	0.755*	-4.515	-3.533
$Y_0=f(Y_2)$	0.884	47.707	0.985	0.746*	-4.219	-3.533

Table 2(b)

$Y_2=f(Y_1)$	1.126	42.398	0.981	0.7519*	-4.135	-3.533
$Y_1=f(Y_2)$	0.871	42.398	0.981	0.7439*	-4.109	-3.533

Table 3(b)

$Y_2=f(Y_1,Y_3)$	0.2716 (2.488)	0.7748 (6.8316)	0.9841	0.4249	-2.1231	-3.533
$Y_1=f(Y_2,Y_3)$	0.5816 (2.488)	0.4055 (1.6351)	0.9645	1.738**	-12.32(0)***	-3.533

Table 4(b)

Co-integration Equation	Independent Variables			Adjusted R^2	CRD W	ADF	Critical value for ADF
	First	Y_7	Y_8				
$Y_2=f(Y_1,Y_7, Y_8)$	0.367 (3.014)	0.635 (3.781)	0.058 (0.273)	0.983	0.665	-1.949	-3.533
$Y_1=f(Y_2, Y_7,Y_8)$	0.602 (3.014)	-0.555 (-2.323)	0.901 (4.012)	0.972	2.24**	-4.512	-3.533

Table 5(b)

Co-integration Equation	Independent Variables					Adjusted R^2	CRDW	ADF
	First	Y_3	Y_4	Y_5	Y_6			
$Y_2=f(Y_1,Y_3, Y_4,Y_5, Y_6)$	0.139 (2.081)	0.369 (2.795)	0.202 (1.565)	-2.947 (-3.71)	0.628 (4.986)	0.995	0.958	-3.967
$Y_1=f(Y_2,Y_3, Y_4,Y_5, Y_6)$	0.905 (2.081)	0.602 (1.666)	-0.535 (-1.631)	3.998 (1.717)	0.130 (0.300)	0.965	1.989	-3.555

Table (C): Results for the Lag Order Selection

Table 1(c)

Models	Z_2 Z_0	Z_0 Z_2	Z_2 Z_1	Z_1 Z_2	Y_2-Y_1 Y_3
Lags length selected	2	2	2	2	2
Log likelihood	61.37	79.18	61.32	75.21	62.590
Akaike AIC	-3.41	-4.49	-3.41	-4.25	-3.369
Schwarz SC	-3.18	-4.26	-3.18	-4.028	-3.051
Models	Y_1-Y_2 Y_3	Z_2-Z_1 Z_7 Z_8	Z_1-Z_2 Z_7 Z_8	Z_2-Z_1 Z_3 Z_4 Z_5 Z_6	Z_1-Z_2 Z_3 Z_4 Z_5 Z_6
Lags length selected	3	4	4	2	3
Log likelihood	78.159	71.497	82.854	63.84	86.16
Akaike AIC	-4.259	-3.515	-4.248	-3.081	-4.198
Schwarz SC	-3.8019	-2.72958	-3.4623	-2.492	-3.328

Table (D) :Results for the Johnson Cointegration Test

The null hypothesis of no co-integration is rejected using both the Trace Statistics and Eigen Value because both statistics are greater than their critical values. However, the null hypothesis of at most one co-integrating vector cannot be rejected in favor of r =2.Thus, the empirical support for one co-integration vector implies that the variables included in all five models are co-integrated and follow a common long-run path. Due to lack of space those Tables are not included here.

Table (E): Results for the Amended Granger Causality Test

Table 1(e)

Equation	F-statistics for EC_{t-1}	F- statistics for independent variable	F- statistics for dependent variable	Direction of Causation
$Z_2=f(Z_{2t-i}, Z_{0t-i}, X_{1-1})$	-0.131 0.851265 [0.364367]	0.523 [0.598]	0.169 [0.845] [2]	$Z_0 \not\rightarrow Z_2$
$Z_0=f(Z_{0t-I}, Z_{2t-i}.X_{2-1})$	-0.145 2.549218 [0.121988]	2.918* [0.071]	0.588 [0.562] [2]	$Z_2 \rightarrow Z_0$ (Short term causality)

Table 2(e)

$Z_2=f(Z_{2t-I}, Z_{1t-i}, X_{1-1})$	-0.119 (0.939) [0.341]	0.515 [0.603]	0.276 [0.760] [2]	$Z_1 \not\rightarrow Z_2$
$Z_1=f(Z_{1t-I}, Z_{2t-i}.X_{2-1})$	-0.151* (2.883) [0.100]	3.598** [0.042]	0.723 [0.494] [2]	$Z_2 \rightarrow Z_1$ (Long term/ Short term causality)

Table 3(e)

Equation	F-statistics for EC_{t-1}	F- statistics for independent variable		F- statistics for dependent variable	Direction of Causation
		First	Z_3		
$Z_2=f(Z_{2t-I}, Z_{1t-i}, Z_{3t-i}, X_{1-1})$	-0.163* (2.915) [0.100]	0.465 [0.633]	1.019 [0.375]	0.684 [0.513]	$Z_1 \rightarrow Z_2$ [long run causality]
$Z_1=f(Z_{1t-I}, Z_{2t-i}. Z_{3t-i}, X_{2-1})$	-0.079 (0.845) 0.367	3.875** [0.034]	1.012 [0.378]	1.086 [0.353]	$Z_2 \rightarrow Z_1$ [Short run causality]

Table 4(e)

Equation	F-statistics for EC_{t-1}	F- statistics. for independent variables			F- statistics for dependent variable	Direction of Causation
		First	Z_7	Z_8		
$Z_2=f(Z_{2t-I}, Z_{1t-i}, Z_{7t-i}\ Z_{8t-i}\ X_{1-1})$	-0.271** (9.489) [0.005]	1.941 [0.166]	5.896** [0.009]	3.031* [0.068]	2.102 [0.145] [2]	$Z_1 \rightarrow Z_2$ Long term causality
$Z_1=f(Z_{1t-I}, Z_{2t-i}. Z_{7t-i}\ Z_{8t-i}\ X_{2-1})$	-0.223 (0.935) [0.351]	2.258 [0.119]	1.166 [0.370]	0.574 [0.687]	0.983 [0.451] [4]	$Z_2 \not\rightarrow Z_1$

Table 5(e)

Equation $Z_2=f(Z_{2\ t-I}, Z_{1\ t-i}, Z_{3\ t-i}, Z_{4\ t-i}, Z_{5\ t-i}, Z_{6\ t-i}, X_{1-1})$							
F-statistics for EC_{t-1}	F- statistics for independent variables					F-statistics For depende	Direction of Causation
	First	Z_{3t}	Z_{4t}	Z_{5t}	Z_{6t}		
-0.348 (2.192) [0.155]	0.108 [0.898]	0.294 [0.748]	0.448 [0.645]	0.678 [0.519]	1.210 [0.319]	0.069 [0.934]	$Z_1 \not\rightarrow Z_2$
Equation $Z_1=f(Z_{1\ t-I}, Z_{2\ t-i}. Z_{3\ t-i}, Z_{4\ t-i}, Z_{5\ t-i}, Z_{6\ t-i}, X_{2-1})$							
-0.093 (2.001) [0.169]	0.979 [0.331]	3.339* [0.079]	0.723 [0.403]	0.692 [0.413]	0.778 [0.386]	0.043 [0.837]	$Z_2 \not\rightarrow Z_1$

Table (F): Results for Granger Causality Test (TY Augmented Lags Model)

Table 1(f)

Dependent Variable	Source of Causation		Direction of Causation
	Z_0 $\chi^2(5)$	Z_2 $\chi^2(5)$	
Z_0	-	9.802** [0.020]	$Z_2 \rightarrow Z_0$
Z_2	0.820 [0.845]	-	$Z_0 \not\rightarrow Z_2$

Table 2(f)

Dependent Variable	Source of Causation		Direction of Causation
	Z_1 $\chi^2(5)$	Z_2 $\chi 2(5)$	
Z_1	-	10.289** [0.016]	$Z_2 \rightarrow Z_1$
Z_2	3.744 [0.290]	-	$Z_1 \not\rightarrow Z_2$

Table 3(f)

Dependent Variable	Source of Causation			Direction of Causation
	Z_1 $\chi^2(5)$	Z_2 $X^2(5)$	Z_3 $\chi^2(5)$	
Z_1	-	9.78** [0.021]	5.211 [0.157]	$Z_2 \rightarrow Z_1$
Z_2	0.486 [0.922]	-	0.421 [0.936]	$Z_1 \not\rightarrow Z_2$

Table 4(f)

Dependent Variable	Source of Causation				Direction of Causation
	Z_1 $\chi^2(5)$	Z_2 $\chi^2(5)$	Z_7 $X^2(5)$	Z_8 $\chi^2(5)$	
Z_1	-	8.986* [0.100]	7.321 [0.197]	5.227 [0.388]	$Z_2 \rightarrow Z_1$
Z_2	1.076 [0.782]	-	8.363** [0.039]	6.800* [0.078]	$Z_1 \not\rightarrow Z_2$

Table 5(f)

Dependent Variable	Source of Causation						Direction of Causation
	Z_1 $\chi^2(5)$	Z_2 $\chi^2(5)$	Z_3 $X^2(5)$	Z_4 $\chi^2(5)$	Z_5 $\chi^2(5)$	Z_6 $\chi^2(5)$	
Z_1	-	2.871 [0.238]	0.559 [0.756]	0.930 [0.628]	1.085 [0.581]	0.466 [0.792]	$Z_2 \not\rightarrow Z_1$
Z_2	1.526 [0.676]	-	0.135 [0.987]	2.259 [0.520]	1.207 [0.751]	0.223 [0.974]	$Z_1 \not\rightarrow Z_2$

Notes: **Table(A)** Y_0= log of real GDP (gross domestic product) including total exports.Y_1= log of real GDP (gross domestic product) excluding total exports.Y_2 = log of real Total exports. Y_3 = log of real Total imports.Y_4 = log of real GDFC (gross domestic capital formation) Y_5 = log of Labor force (measured as ratio of total population)Y_6 = log of real exchange rate (measured as Rs./US$) Y_7= log of real total imports of capital goods including industrial raw material for capital goods.Y_8= log of real total imports of consumer goods excluding capital goods and industrial raw material for capital goods. Critical values in Table1(a) have been taken from Dickey and Fuller (1979).**Table (B).**The critical values for CRDW statistic in the vicinity of 50 observations are 0.78 at 95 percent and 0.69 at 90 percent levels of confidence, respectively. Critical value for ADF at 95% is -3.533. **Table (C)** Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC) and Log likelihood are used to select the lag length of the VAR system, which is achieved by minimizing the AIC and SBC and maximizing log Likelihood. Those cases where the choice criteria are different, it is decided to use the one that suggests the smaller order. **Table (E)** EC denote the error-correction terms represented by X_1, X_2 of corresponding co-integrating equations as given in Table1(b) The numbers in the parentheses of EC are *F*-statistics. The numbers in the square brackets are the lag order of VAR. The values in the square brackets under the F-statistics are the probability values (or the exact level of significance). **Table (F)** The values in the square brackets under the χ^2-statistics are the probability values (or the exact level of significance).*Significant at 10%, ** Significant at 5%, *** Significant at 1% for all the Tables.

Figure 1: Bivariate Model

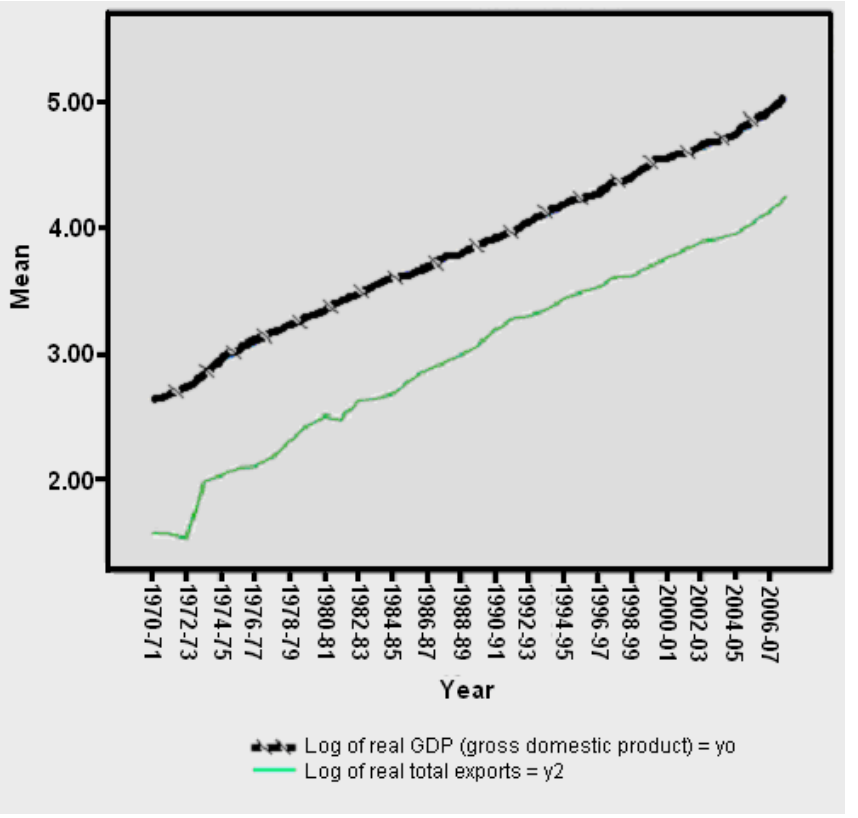


Figure 2: Bivariate Model (Excluding Exports)

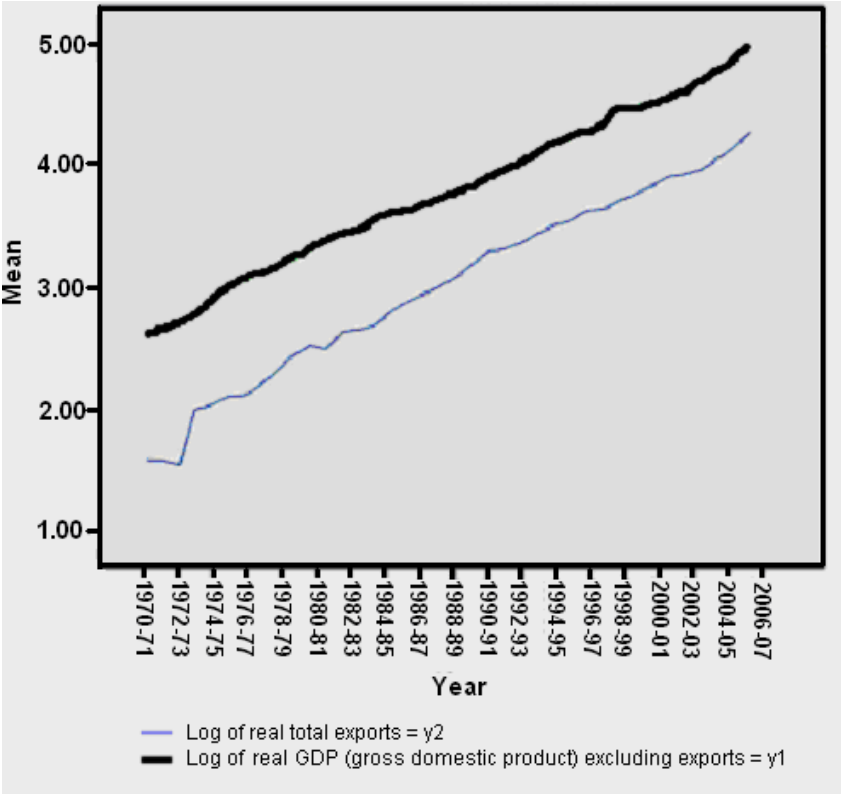


Figure 3: Trivariate Model

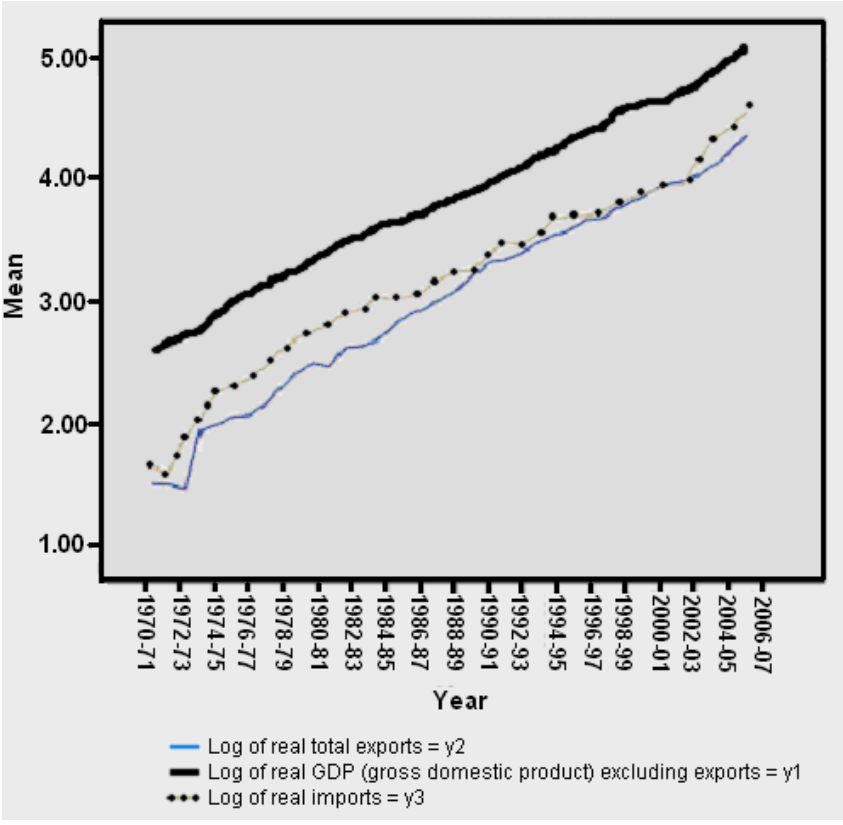


Figure 4: Four Variate Model

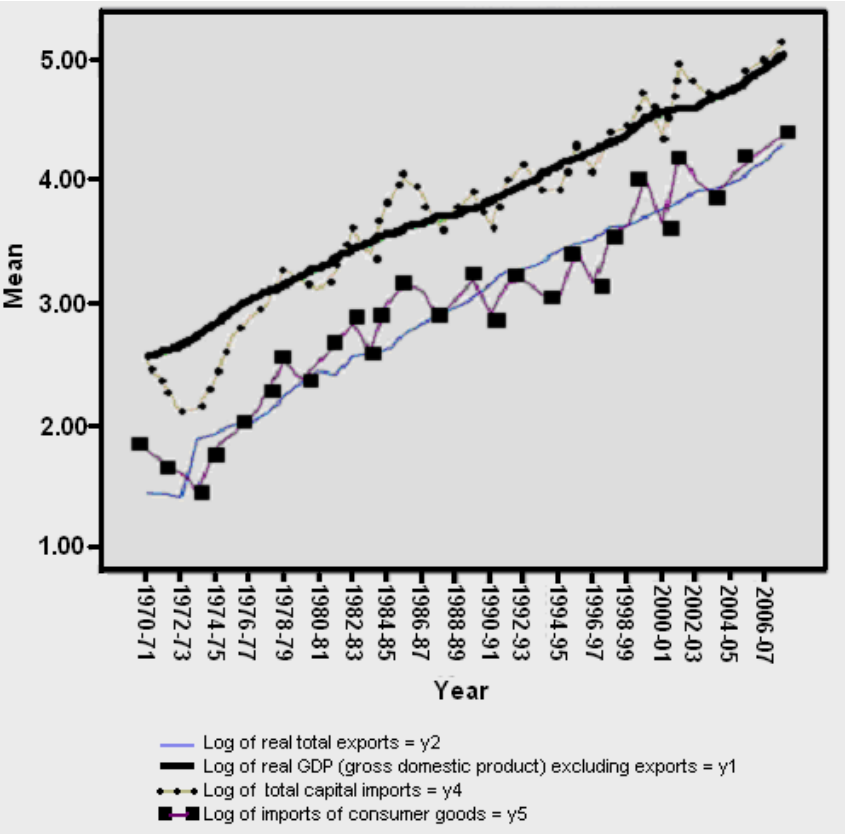
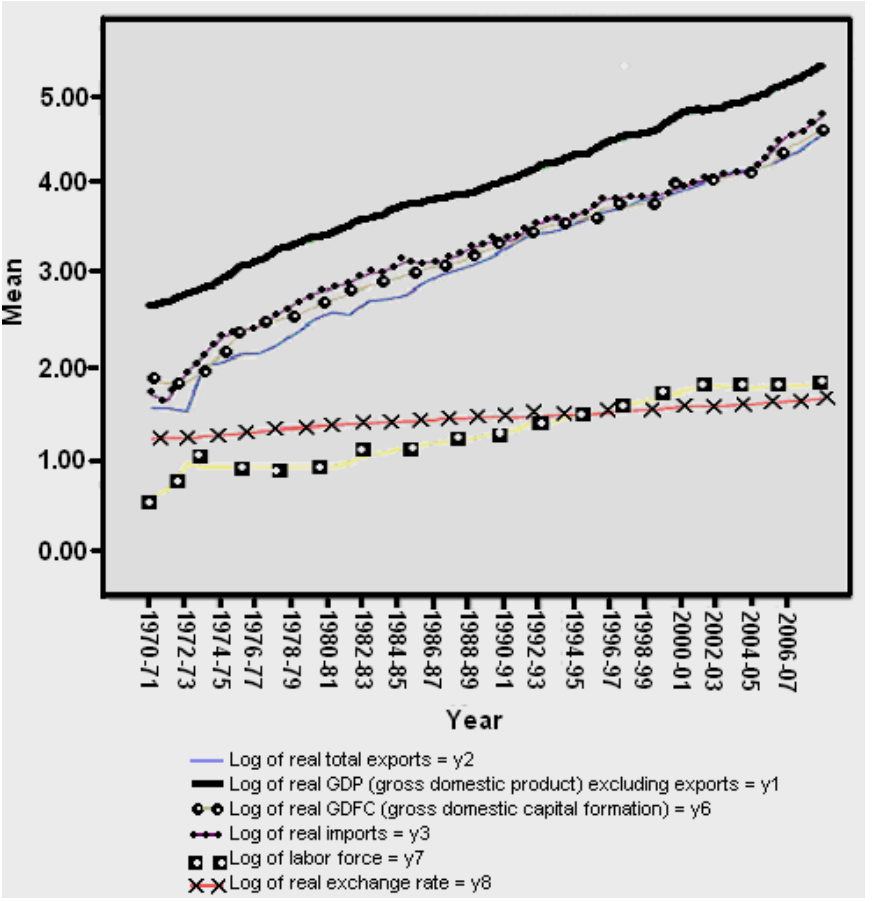


Figure 5: Multivariate Model



Source: Figures 1, 2, 3, 4 and 5 are generated from authors' own calculations

References

Akbar, M. and Z. Naqvi 2000. "Export diversification and the structural dynamics in the growth process: The case of Pakistan" *The Pakistan Development Review* 39 (4) part II :573-589.

Alam, M. 2003 "Manufactured exports, capital goods, imports, and economic growth, experience of Mexico and Brazil" *International Economic Journal* 17(4): 85-105.

Anwar, Muhammad S. and R. Sampath 2000. "Exports and Economic Growth" *Indian Economic Journal* 47 (3) : 79- 88.

Arnade, C. and U. Vasavada 1995. "Causality between productivity and exports in agriculture: evidence from Asia and Latin America" *Journal of Agricultural Economics* 46:174-186.

Bahmani-Oskooee, M. and J. Alse 1993. "Export growth and economic growth: an application of cointegration and error correction modeling" *The Journal of Developing Areas* 27:535-542.

Balassa, B. 1978. "Exports and economic growth: further evidence" *Journal of Development Economics* 5:181-189.

Balassa, B. 1980. "The process of industrial development and alternative development strategies" *Princeton Essays in International Finance* Princeton, NJ: Princeton University, Department of Economics.

Bhagwati, J.N. 1988. *Protectionism.*Cambridge, MA : MIT Press.

Caporale, G., M., C.Hassapis and N. Pittis 1998. "Unit roots and long run causality, investigating the relationship between output, money and interest rates" *Economic Modelling* 5(1): 91-112.

Chandra, R. 2002. "Export growth and economic growth, an investigation of causality in India" *Indian Economic Journal* 49(3):64-73.

Dickey, D.A. and W.A. Fuller 1979. "Distributions of the estimators for autoregressive time series with a unit root" *Journal of the American Statistical Association* 74: 427-481.

Dutt, S.D. and D. Ghosh 1994. "An empirical investigation of the export growth-economic growth relationship" *Applied Economics Letters* 1: 44-48.

Edwards, S. 1998. "Openness, productivity and growth: What do we really know?" *Economic Journal* 108 (2): 383-398.

Feder, G. 1983. "On exports and economic growth" *Journal of Development Economics* 12:59-73.

Fosu, A.K. 1990. "Exports and economic growth: the African case" *World Development Review* 18:831-835.

Fosu, A.K. 1996. "Primary exports and economic growth in developing countries" *World Economy* 19: 465-475.

GoP 2005. *Handbook of Statistics on Pakistan.* State Bank of Pakistan.

------ 2006. *Economic Survey of Pakistan.* Ministry of Finance, Govt. of Pakistan, Islamabad.

------ 2007. *Economic Survey of Pakistan.* Ministry of Finance, Govt. of Pakistan, Islamabad.

------ 2008. *Economic Survey of Pakistan.* Ministry of Finance, Govt. of Pakistan, Islamabad.

Granger, C.W.J. and P. Newbold 1974. "Spurious regressions in econometrics" *Journal of Econometrics* 2: 111-120.

Gujarati, D. 1995. *Basic Econometrics.* Third Edition, McGraw-Hill International Editions.

Heller, P.S. and R.C. Porter 1978. "Exports and growth: an empirical re-investigation" *Journal of Development Economics* 5:191-193.

Henriques, I. and P. Sadorsky 1996. "Export-led growth or growth-driven exports? The Canadian case" *Canadian Journal of Economics* 96:540-555.

Johansen, S. 1991. "Estimation and hypothesis testing of Cointegration vectors in Gaussian Autoregressive Models" *Econom*trica* 59:1551-1580.

Jung, S.W. and P.J. Marshall 1985. "Exports, growth and causality in developing countries" *Journal of Development Economics* 18:1-12.

Kemal, A. R., Musleh ud Din, Q. Usman, F. Lloyd and S. Sirimevan 2002. "Exports and Economic Growth in South Asia" A Study Prepared for the South Asia Network of Economic Research Institutions.

Kemal, M. and U. Qadir 2005. "Real Exchange Rate, Exports And Imports Movements: A Trivariate Analysis" *The Pakistan Development Review* 44:2 : 177-195.

Khan, A. H. and N. Saqib 1993. "Exports and Economic Growth: The Pakistan Experience" *International Economic Journal* 7(3) : 53-64.

Khan, H. Ashfaque, A. Malik and L. Khan 2000. "Export, Growth And Causality: An Application Of Co- Integration And Error- Correction Modeling" *The Pakistan Development Review* 39 (4) part II : 1001-1012.

Kokko, A. 2002. "Export-Led Growth In East Asia: Lessons For Europe's Transition Economies" European Institute of Japanese Studies Working Paper No. 142.

Kugler, P. and J. Dridi 1993. "Growth and exports in LDCs: a multivariate time series study" *International Review of Economics and Business* 40:759-767.

Love, J. 1994. "Engines of growth: the export and government sectors" *World Economy* 17: 203-218.

Love, J. and R. Chandra 2004. "Testing export-led growth in India, Pakistan and Sri Lanka using a multivariate framework" *Manchester School* 72 (4): 483-496.

Love, J. and R. Chandra 2005. "Testing export-led growth in South Asia" *Journal of Economic Studies* 32 (2): 132-145.

Marin, D. 1992. "Is the export-led hypothesis valid for Industrialized countries?" *Review of Economics and Statistics* 74 :678-688.

McDonald, S. and J. Roberts 1996. "Misspecification and cross-country growth regressions" *Applied Economics Letter* 3: 413-416.

Papanek, G.. F. 1973. "Aid, foreign private investment, savings, and growth in less developed countries" *Journal of Political Economy* 81:120-130.

Phillips, P. C. B. and J. Perron 1988. "Testing for a unit root in time series regression" *Biometrika* 75: 335-346.

Prebisch , R. 1950. "The Economic Development of Latin America And Its Principal Problem" United Nations, New York.

Quddus, M. and I. Saeed 2005. "An Analysis Of Exports And Growth In Pakistan" *The Pakistan Development Review* 44(4) part II : 921-937.

Ram, R. 1985. "Exports and economic growth: some additional evidence" *Economic Development and Cultural Change* 33, 415-425.

Rana, B. 1985. "Exports and Economic Growth in the Asian Region" ADB Economic Staff Paper No. 25.

Reinsel, C. and A. Sung 1992. "Vector autoregressive models with Unit Roots and reduced rank structure, estimation, likelihood ratio test, and Forecasting" *Journal of time Series analysis* 13:353-375.

Riezman, R.G., P. M. Summers and C.H. Whiteman 1996. "The engine of growth or its handmaiden? A time series assessment of export-led growth" *Empirical Economics* 21:77-113.

Salvatore, D. and T. Hatcher 1991. "Inward and outward oriented trade strategies" *Journal of Development Studies* 27: 7-25.

Sargan, J.D. and A. Bhargva 1983. "Testing residuals from least squares, Regression for being generated by Gaussian random walk" *Econometrica* 51:153-174.

Serletis, A. 1992. "Export growth and Canadian economic development" *Journal of Development Economics* 38: 133-145.

Shirizi, S. Nasim and T. A. Manap 2004. "Exports And Economic Growth Nexus: The Case Of Pakistan" *The Pakistan Development Review* 43(4) Part II): 563-581.

Shirazi, S. Nasim and T. A. Manap 2005. "Exports-Led Growth Hypothesis: Further Econometric Evidence from Pakistan**"** *The Developing Economies* XLIII-4 :472–488.

Singer and W. Hans 1950. "The distribution of gains between investing and borrowing Countries" *American Economic Review* 40(2): 473-485.

Sprout, R.V.A. and J.H. Weaver 1993. "Exports and economic growth in simultaneous equations model" *Journal of Developing Areas* 27:289-306.

Toda, H.Y. and T. Yamamoto 1995. "Statistical inference in vector autoregressions with possibly integrated processes" *Journal of Econometrics* 66: 225-250.

Tyler, W. 1981. "Growth and export expansion in developing countries: some empirical evidence" *Journal of Development Economics* 9:121-130.

UNIDO 1991. "*Towards Industrialization and Revitalization*" Blackwell, Oxford. Weber, A., 1909. Theory of the Location of Industries. University of Chicago Press, Chicago, IL

Book Review

International Trade Centre, UNCTAD/WTO & Small and Medium Enterprise Development Authority. Trade in Services: An Answer Book for Small and Medium-Sized Exporters. Lahore: ITC/SMEDA. 2007. Paperback. 196 pages. Price not given.

Pakistan's small and medium sized exporters have confronted a range of problems to expand and enlarge their export base over the years. These problems are more severe for small exporters working in the services sector and as such, they have minor contribution in the already meager exports of the services industry.

"*Trade in services: An answer book for small and medium-sized exporters*" is an attempt to provide useful guidelines to the small and medium sized exporters of the services sector in order to enable them to compete and catch up with the global services industry. The book was long overdue in the sense that no serious intellectual efforts were made in the past to build the capacity of the SMEs in the services sector which constitute more than 80% of the small and the medium enterprises. Following the establishment of SMEDA, more than a decade ago, some effort has been made for enhancing the awareness and potential of the small and medium enterprises but a focus on the services sector was missing.

The book starts with the process of decision making to export a service. It explains the meaning of services export, the advantages that are likely to accrue from it and the potential challenges and risks that may confront the exporters when competing in the global markets.

It then outlines the measures required to develop an export strategy, its main ingredients and steps to ensure the success of such a strategy. The exporters' benchmark of success is the increase in the firms' productivity and profits, which can be delivered by finding appropriate means to finance export market development in the light of domestic markets development strategies and their relevance in markets abroad. A good

understanding of these strategies not only ensures better and sound decisions, but also tangible rewards for the exporters.

The third part is concerned with the selection of markets. Targeting the right markets and their customers is perhaps the most important factor in driving exports of the services sector. This is done through research, better information about entry and exit, restrictions of the particular type of market, knowledge about industry standards and its legal and regulatory framework. An exporter equipped with reliable information on all these factors can set himself apart from others and make good fortunes. The availability of information on these questions in the handbook will help exporters identify the right markets and customers.

The export of goods and services is no longer confined to pure economic principles. Cultural considerations and awareness about cultural differences also play an important role in enhancing the volume of exports. In this regard, it is important to highlight the main differences in business practices across different countries and the implications of culture for the design of service delivery. In a country like Pakistan, where the gender gap is high as compared to other developed countries, the incorporation of the principles of promoting gender considerations also plays an important role for foreign customers to be attracted to Pakistani exports. The roles of businesswomen, language constraints and other social values also determine the competitive edge of service providers over others.

The handbook also focuses on the information required for a viable marketing strategy by emphasizing on instruments of information technology. The development of a good website and business cards also plays an important role in the promotion of the services offered for sale. In addition, quality assurance is of the essence when it comes to exporting a service. The small and medium sized exporters must implement quality standards like ISO 9001, 2000 and environmental standards like ISO 14000. Adoption of such standards holds the key to exploring new markets by the services industry. The handbook explains the significance of the standards and their relevance for specific services sector.

The decision to price the service is regarded as an important variable in determining customers purchasing decisions. The handbook of trade in services also sheds light on how to work out appropriate pricing strategies, which don't only ensure good profits, but also maintain the competitiveness of products. Relevant sources on learning negotiation skills on pricing strategies are also provided in the book.

The question of contracting a deal with the supplier is also very important from the perspective of small and medium sized exporters in Pakistan. These exporters are not well acquainted with financial services like e-banking, insurance, and management of foreign exchange risk. These questions are addressed in order to equip the exporters to better deal with their customers in foreign countries. Moreover, the book also suggests resources for traveling purposes and calendars in order to provide better understanding to exporters about traveling restrictions and other safeguard measures.

Perhaps the most important contribution of the book is to provide answers to exporters on issues related to the World Trade Organization (WTO). It highlights the functions and objectives of the WTO and its General Agreement on Trade in Services (GATS). It provides information on resources regarding liberalization of the services sector and commitments made by individual countries to open specific services industries. In addition, exporters are informed about the problems and challenges of the services sector confronted during trade with other countries and the role of dispute settlement mechanisms to resolve such disputes under the WTO system.

In short, the book can serve as a good business guide for small and medium sized exporters for successfully exporting their services to other countries and competing with the exporters of other countries in the trade of services.

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