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TRADE POLICY AND ECONOMIC GROWTH IN BANGLADESH: A REVISIT

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Abstract. The paper examines trade policy and economic growth for Bangladesh. The paper has employed cointegration and multivariate Granger Causality test developed by Toda and Yamamoto (1995) to study the long-run and short-run dynamics among exports growth, imports growth and real output growth over the period 1973 to 2002. Our results strongly support a long-run relationship among the three variables for Bangladesh. The results show feedback effects between exports and output growth and also between imports and output growth in the short-run. A strong feedback effects between import growth and export growth has also been established.

I. INTRODUCTION

The justification for free trade and the various indisputable benefits that international specialization brings to the productivity of nations have been widely discussed in the economic literature (see *e.g.* Bhagwati, 1978; Krueger, 1978). The suitability of trade policy — import substitution or export promotion — for growth and development has been also debated in the literature. In 1950s and 1960s, most of the developing countries followed import substitution (IS) policies for their economic growth. The proponents

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of the IS policy stress upon the need for developing countries (LDCs) to evolve their own style of development and to control their own destiny. This implies policies to encourage indigenous, policies as stated by Arrow, "learning by doing" in manufacturing and the development of indigenous technologies appropriate to country's resource endowments (*see* Todaro and Smith, 2003: p. 556). Since mid-1970s, in most developing countries, there has been considerable shift towards export promotion strategy (EP), particularly, in the era of globalization and introduction of WTO regimes. This approach postulates that export expansion and may also leads to efficient resource allocation, economies of scale and production efficiency through technological development, capital formation, employment generation and hence acceleration of economic growth.

Theoretical agreement on export-led growth emerged among neoclassical economists after the successful story of newly industrialized countries. They argue that, for instance, Hong Kong (China), Taiwan, Singapore and the Republic of Korea, the Four Tigers, have been successful in achieving high and sustained rates of economic growth since early 1960s; because of their free-market, outward-oriented economies (see, *e.g.* World Bank, 1993). However, the reality of the tigers does not support this view of how their export success was achieved. The production and composition of export was not left to the market but resulted as much from carefully planned intervention by the governments. As Amsden (1989) states that the approach behind the emergence of this new 'Asian Tiger' is a strong, interventionist state, which has willfully and abundantly provided tariff protection and subsidies, change in interest and exchange rates, management investment, and controlled industry using both lucrative carrots and threatening sticks.[1]

Nevertheless, export-led growth hypothesis has not only been widely accepted among academics (Feder, 1982 and Krueger, 1990) and evolved into a "new conventional wisdom" (Tyler, 1981; Balassa, 1985), but also has shaped the development of a number of countries and the World Bank (World Bank Development Report, 1987).

The literature, which has an extensive inventory of models that stress the importance of trade in achieving a sustainable rate of economic growth, have

[1]Japan's development is also narrated in Inc., Three tiers, bureaucrats, banks and businessman. These three quarters joined hands and cooperated to accelerate growth in Japan. Recently development of hosiery and other cotton related product's development in Bangladesh is a good example of such development, *i.e.* from imported inputs.

focused on different variables, such as degree of openness, real exchange rate, tariffs, terms of trade and export performance etc., to verify the hypothesis that open economies grow more rapidly than those that are closed (see *e.g.* Edwards, 1998). The advocates of the export-led strategy and free trade point out that most developing countries, mostly in Latin America, which followed inward-oriented policies under the import substitution strategy (IS), had poor economic achievements (Balassa, 1980).

Thereafter, many LDCs were forced to stimulate their export-led orientation, even more because most of them have to rely on multilateral organizations, to implement and adjust stabilization programs to improve their economic imbalances. Promoting exports would enable LDCs to improve imbalances in the external sector and at the same time assist them in their recovery. Consequently, numerous empirical research works has been done on the relationship between exports and growth. However, the results are not consistent for both developed and developing countries. Thus, further research in this regard will strengthen the debate on export led growth.

Given the above background, in this paper an attempt has been made to reinvestigate the relationship between export promotion and economic growth in the case of Bangladesh. The paper investigates not only the existence of a long-run relationship among economic growth, exports and imports, but also explores the short-run causal relationship between these variables for Bangladesh by employing the multivariate Granger causality methodology developed by Toda and Yamamoto (1995). Hardly any comprehensive study has been done so for to examine the existence and nature of any causal relationship between output, imports and exports by employing Toda and Yamamoto's (1995) multivariate Granger causality procedure for Bangladesh, so far.

The rest of the paper is organized as follows: Section II provides a brief overview of the economy. Section III consists upon review of literature. Section IV discusses data and methodological issues. Section V presents empirical findings. Section VI concludes the paper.

II. THE BANGLADESH ECONOMY AND PERFORMANCE OF FOREIGN SECTOR

Bangladesh has witnessed a respectable growth record in its real GDP, as well as, in various sectors. Average GDP growth rate was 2.3 percent in 1970s, increased to 4.8 percent during 1980s and 1990s, respectively. The growth rate remained in the range of 4.8 percent to 5.4 percent in the recent years. The GDP growth rate is broad based extending to over all major

sectors of the economy. Agricultural sector's growth rate, which was very low in 1970s, increased to 2.7 percent and further to 2.9 percent during 1980s and 1990s, respectively. However, it dropped and again picked up to 3.3 percent in 2003. The recent growth was 3.7% in 2006. Industrial and services sectors showed a good growth performance over past decades, and also showed a good performance in the recent years (*see* Table 1). During 2000-05, average per year GDP growth was 5.5% while industrial sector grew by 7.5% during the same period.

TABLE 1

Gross Domestic Product and Sectoral Growth Rate

	1970-80	1980-90	1990-00	2001	2003	2000-05 (Average)
GDP	2.3	4.8	4.8	4.8	5.4	5.5
Agriculture	0.6	2.7	2.9	3.1	3.3	3.3
Industry	5.2	4.9	7.3	7.4	7.3	7.2
Manufacturing	5.1	3.0	7.2	–	–	–
Services	3.8	4.4	4.5	5.5	5.8	5.5

Source: *World Development Indicators* (various issues), *Economic Bulletin* (2007).

There has been a structural change in the economy over the past decades. The share of agricultural sector in GDP declined form 32.0 percent in 1981 to 20.2 percent in 2005, while that of industrial sector's contribution to GDP increased from 22.0 percent in 1981 to 28.3 percent in 2005. The share of services sector in GDP remained in the range of 46 percent to 49.4 percent during the same period (*see* Table 2). Despite the fact that a sharp structural change took place in the economy, yet it is heavily based on agricultural sector in terms of support to industrial sector and employment generation.

Bangladesh like other countries of the region concentrated initially on the import substitution policy with different trade barriers. This is reflected in its share of trade in GDP. However, over time it has opened its economy

to external trade. The share of total trade is almost doubled over two decades (*see* Table 3).

TABLE 2

Sectoral Composition of Gross Domestic Product

Sector	1981	1995	1998	1999	2000	2001	2002	2005
Agriculture	32.0	25.0	24.0	25.0	25.6	25.0	24.0	20.2
Industry	22.0	24.0	25.0	24.0	25.7	26.2	26.7	28.3
Services	46.0	51.0	51.0	50.0	48.7	48.8	49.3	49.4

Source: *World Development Indicators* 2001 and the figures for 2000 to 2005 taken from http://www.bangladesh-bank.org/pub/annual/anreport/ar0203/chap1.pdf. *Economic Bulletin* (2007).

TABLE 3

Trends of Trade (% of GDP)

	1960	1970	1980	1990	1998	2002	2005
Exports as % of GDP	7.40	6.20	4.20	6.30	13.80	12.47	15.4
Imports as % of GDP	8.10	10.80	15.90	13.80	18.90	16.20	23.1
Total Trade as % of GDP	15.50	17.00	20.10	20.10	32.70	28.67	38.5

Source: *World Development Indicators* 2001 and the figures for 2000 to 2005 are retrieved from http://www.bangladesh-bank.org/pub/annual/anreport/ar0203/chap9.pdf.

Bangladesh has taken many steps to open its economy and to boost its exports. A number of export support measures are in the operation. These among other include simplifying export procedures and helping the private sector achieve efficiency, enhancing technological strength and productivity, ensuring maximum use of local materials in the production of export goods and encouraging establishment of backward linkage industries, participate in the international trade fairs and specialized fairs, making appropriate development and expansion of infrastructure conducive to export, and taking necessary steps .to assist procurement of raw materials by the export-oriented

industries at world price. The other export support measures are 'Special Bonded Warehouse', the 'Duty Drawback System', 'Export Development Fund' and 'Export Credit Guarantee Scheme'. It has also adopted liberal foreign investment policies to attract private investment in the export sectors.

III. REVIEW OF LITERATURE

Generally, the empirical studies regarding the relationship between exports and output growth can be separated into two categories. The first type of empirical investigation focuses on cross-section analysis, and the second concentrates on country-specific studies; time series analysis.

In the cross section analysis, Kravis (1970), Michaely (1977), Bhagwati (1978), and to name a few, use the Spearman's rank correlations test to explore the relationship between exports and growth, while Balassa (1978, 1985), Tyler (1981), Kavoussi (1984), Ram (1987), Heitger (1987), Fosu (1990) and Lussier (1993) investigate exports and growth performance within a neoclassical framework by using ordinary least squares (OLS) on cross section data. These studies, in general, find that export is an important variable in determining economic growth. Gonclaves and Richtering (1986) conduct empirical analysis for a sample of 70 developing countries for the period 1960-1981, and find that export growth rate and change in export/ GDP ratio are significantly correlated with GDP growth. Sheehey (1993) finds inconsistent evidence of higher productivity in the export sector compared with the non-export sector, while, Colombatto (1990), using OLS, with a sample of 70 countries, rejects the export-led growth hypothesis.

Cross sectional empirical investigations can explain to some extent why growth differs across a wide spectrum of countries. Nevertheless, this type of cross-section investigation has its deficiencies, which raises doubts about their usefulness. In these studies, countries in similar stages of development were grouped together. Implicitly assume a common economic structure and similar production technology across different countries. However, this assumption is most likely unrealistic. Thus, the results reported in theses studies are clearly vulnerable to criticism. Moreover, cross sectional analysis ignore the shifts in the relationship between variables overtime within a country, while export growth and economic growth is a long-run phenomenon, which can not be studied by using cross sectional analysis.

With recent developments in econometrics, emphasis has been given to the time series analyses to determine a long-term relationship between exports and economic growth and the direction of causality, if such relationship exists. It may be pointed out that the most recent time series investigations

concerning LDCs that have used the econometric methodology of cointegration have not been able to establish unequivocally that a robust relationship between these variables indeed exist in the long term, (see *e.g.* Islam, 1998). While, some have been able to find a long-run relationship; many others have rejected the export-led hypothesis.

Some studies also find that the effect of exports on economic growth depends on the level of development of the country concern and the composition of exports itself (see *e.g.* Tyler, 1981; Dadaro, 1991; Michaely, 1977; Singer and Gray, 1988; Watanabe, 1985; and Kavoussi, 1985).

Jung and Marshall (1985), for instance, based on the standard Granger causality tests, analyze the relationship between export growth and economic growth using time series data for 37 developing countries and find evidence for the export-led growth hypothesis in only 4 (Indonesia, Egypt, Costa Rica, and Ecuador) out of the 37 countries included in the sample. Using causality test, Chow (1987) investigates the causal relationship between export growth and industrial development in eight newly industrialized countries (NICs). It is revealed that in most NICs (except Argentina) there is strong bi-directional causality between the export growth and industrial development. Chow's results are in contrast to Jung and Marshall for four out of six countries common in the two samples, namely Brazil, Korea, Mexico and Taiwan. More specifically, as opposed to Chow's evidence of dual causality between exports and economic growth, Jung and Marshall find no significant causality in Brazil or Mexico, and causality only from output to exports in Korea and Taiwan. The contrast in empirical findings of the two studies may be partly explained by the fact that Chow uses output of the manufacturing sector as a measure of aggregate output as opposed to Jung and Marshall (1985), who utilize gross domestic product.

Darrat (1986), in a study of four Asian NICs (Hong Kong, South Korea, Singapore, and Taiwan), finds no evidence of unidirectional causality from exports to output in all the four economies. In the case of Taiwan, however, the study detects unidirectional causality from output growth to export growth. In another study, Darrat (1987) rejects the export-led growth hypothesis in three out of four cases. He supports the case of Republic of Korea only. Likewise, Ahmad and Kwan (1991) reject the export-led growth hypothesis in their empirical study of 47 African developing countries. Bahmani-Oskooee *et al.* (1991), based on a sample of 20 less-developed countries, find the support of export-led growth hypothesis only in the case of Indonesia, Korea, Taiwan and Thailand. Their study confirms the finding of Jung and Marshall (1985) for Indonesia; still two studies reach different

conclusions for Korea, Taiwan and Thailand. Dodaro (1993) finds a positive causality from exports to GDP in seven out of 87 countries.

Using Error Correction Modeling (ECM) approach, Bahmani-Oskooee and Alse (1993) re-examines the relationship between export growth and economic growth for nine developing countries and find strong support for the export-led growth hypothesis for all the countries included in the sample. Likewise, Dutt and Ghosh (1996) find support for the export-led growth hypothesis in about half of the 26 countries in their study. Furthermore, Xu (1996) also finds support for export-led growth in 17 out of 32 developing countries included in his study. Al-Yousif (1997) uses a multivariate model to examine the relationship in the case of Malaysia. His study supports the export-led growth theory as a short-run phenomenon.

It is commonly accepted that many East Asian countries have achieved higher rates of economic growth through export-led industrialization; however, the empirical evidence is generally mixed. Ghartey (1993), using a vector auto-regressive model for Taiwan, USA and Japan, finds export-led growth in Taiwan, economic growth Granger-causes export growth in the USA, and a feedback causal relationship exists in the case of Japan. On the contrary, Kwan *et a1*. (1996) find mixed results for Taiwan, while Boltho (1996) finds that domestic forces rather than foreign demand propelled long run growth in Japan. Ahmed and Harnhirun (1996) find no support for the export-led growth hypothesis for five ASEAN economies. Gupta (1985) finds bi directional association between exports and economic growth for Israel and South Korea.

Nandi (1991) and Bhat (1995), for example, find evidence of export-led growth hypothesis for India, while Ghatak and Wheatley (1997) find that export growth is Granger-caused by output growth in India. On the other hand, Xu (1996) rejects the export-led growth hypothesis for India for the period 1960-1990.

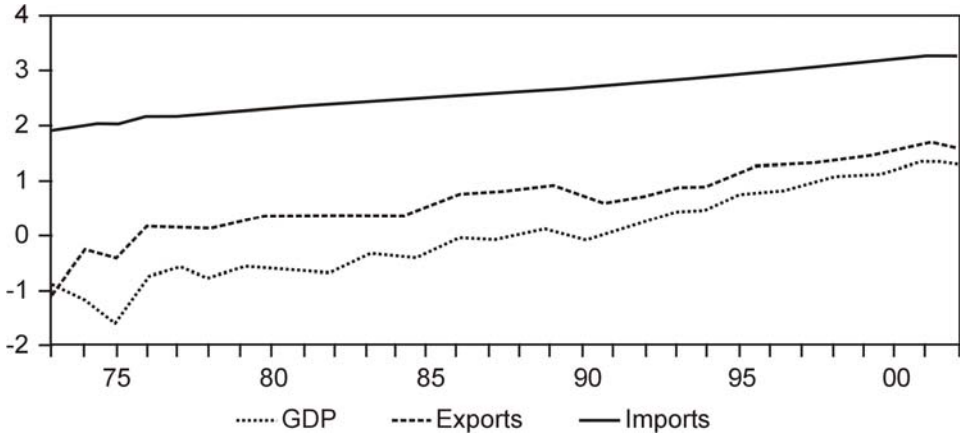
Recent studies carried out pertaining to Pakistan. Khan and Saqib (1993) use a simultaneous equation model and find a strong relationship between export performance and economic growth in Pakistan. Mutairi (1993) finds no support for the period 1959-91, while Khan *et al.* (1995) find strong evidence of bi-directional causality between export growth and economic growth for Pakistan.

Rana (1985) estimates an export-augmented production function for 14 Asian developing countries including Bangladesh. The evidence supports that exports contribute positively to economic growth. Ahmed *et al.* (2000)

investigate the relationship between exports, economic growth and foreign debt for Bangladesh, India, Pakistan Sri Lanka and four South East Asian countries using a trivariate causality framework. The study rejects the export-led growth hypothesis for all the countries (except for Bangladesh) included in the sample. Kemal *et al.* (2002) investigate export-led hypothesis for five South Asian Countries including Pakistan, India, Bangladesh, Sri Lanks and Nepal. The study finds a strong support for long-run causality from export to GDP for Pakistan and India, and bi-directional causality is found for Bangladesh, Nepal and Sri Lanka. The study also finds short-run causality from exports to GDP for Bangladesh and Sri Lanka, and reverse short-run causation — from GDP to exports — for India and Nepal.

FIGURE 1

Economic Growth, Imports and Exports Growth in Bangladesh



Though, results of these studies are mixed, however, in general we may say that the level of development is an important factor in determining the export-economic growth relationship. The above-cited studies, implicitly assume that such economies are rich in resources and homogenous in the export structure and can implement the export expansion policies at a sufficiently fast rate. Developing economies, such as Bangladesh, where domestic resources6 are limited, export expansion still needs to import some goods that do not exist in domestic market but play a key role in the manufacturing of the export driven goods. It still needs to locate and import some necessary technology in order to have a competitive position. This can be seen from Figure 1 where the growth of import and export move in a uniform way. It is important to study whether import as well as export play vital role in economic growth. In other words, if we study the long-run

relationship and causality structure without including import will lead to invalid inference. It may be noted that the approach of using a simple two-variable framework in the causality test without considering the effects of other variable, such as imports, is subject to a possible specification bias.

Keeping in view the above, the paper attempts to reinvestigate not only the existence of a long-run relationship among economic growth, exports and imports by using cointegration techniques, but also to explore the short-run causal relationship between these variables for Bangladesh by employing the multivariate Granger causality methodology developed by Toda and Yamamoto (1995). To the best of our knowledge, no study has been done to examine existence and nature of any causal relationship between output, imports and exports by employing Toda and Yamamoto's (1995) multivariate Granger causality procedure for Bangladesh.

IV. DATA AND METHODOLOGICAL ISSUES

DATA

Annual data from-1973 to 2002 on real GDP, real exports and real imports are retrieved from IMF's International Financial Statistics. All the time series are transformed into logarithms. Plot of the logarithms of the three time series are shown in Figure 1. The Figure shows that the logarithms of real GDP, '*y*' the real export, '*x*' and the real imports, '*m*' exhibit strong upward trends. This provides anecdotal evidence that the three series tend to move together.

THE METHODOLOGICAL ISSUES

1. Cointegration

One of our objectives is to investigate the long-run dynamics relationship among the three variables, *i.e.* Imports and Exports and output growth. The system can be represented as follows:

$$Y_t = \beta_0 + \beta_1 x_t + \beta_2 m_t + \varepsilon_t \qquad (4.1)$$

Where the vector (y, x and m) represent log levels of real output, exports and real imports respectively. The coefficients β_1 and β_2 are expected to be positive.

In implementing the tests for cointegration we use the likelihood ratio test due to Johansen and Juselius (1990). The method involves estimating the following unrestricted vector autoregressive (VAR) model:

$$Y_t = A_0 + \sum_{j=1}^{p} A_j Y_{t-j} + \varepsilon_t \tag{4.2}$$

Where Y_t is an $n \times 1$ vector of non-stationary I(1) variables, in our case $Y_t \equiv$ (y, x and m), n is the number of variables in the system, three in this case. A_0 is a 3×1 vector of constants, p is the number of lags, A_j is a 3×3 matrix of estimable parameters, and ε_t is a 3×1 vector of independent and identically distributed innovations. If Y_t is cointegrated, it can be generated by a vector error correction model (VECM):

$$\Delta Y_t = A_0 + \sum_{j=1}^{p-1} \Gamma_j \Delta Y_{t-j} + \Pi Y_{t-1} + \varepsilon_t \tag{4.3}$$

Where:

$$\Gamma_j = -\sum_{i=j+1}^{p} A_i \text{ and } \Pi = \sum_{j=1}^{p} A_j - I ,$$

Δ is the difference operator, and I is an $n \times n$ identity matrix.

The rank of the matrix Π determines the number of cointegrating vectors since the rank of Π is equal to the number of independent cointegrating vectors. Thus, if the rank of Π equals 0, the matrix is null and equation (5) becomes the usual VAR model in first differences. If the rank of Π is r where $r < n$, then there exist r cointegrating relationships in the above model. In this case, the matrix Π can be rewritten as $\Pi = \alpha\beta'$ where α and β are $n \times r$ matrices of rank r. Here, β is the matrix of cointegrating parameters and α is the matrix of weights with which each cointegrating vector enters the above VAR model. Johansen provides two different test statistics that can be used to test the hypothesis of the existence of r cointegrating vectors, namely, the trace test and the maximum eigenvalue test. The trace test statistic tests the null hypothesis that the number of distinct cointegrating relationships is less than or equal to r against the alternative hypothesis of more than r cointegrating relationships, and is defined as:

$$\lambda_{trace}(r) = -T \sum_{j=r+1}^{p} \ln\left(1 - \hat{\lambda}_j\right) \tag{4.4}$$

Where T is the number of observations and the λs are the eigenvalues of Π in equation (4.3). The maximum eigenvalue test statistic tests the null hypothesis that the number of cointegrating relationships is less than or equal to r against the alternative of $r + 1$ cointegrating relationships, is defined as:

$$\lambda_{\max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \tag{4.5}$$

One of the critical parts of the Johansen and Juselius approach is to determine the rank of matrix Π, since the approach depends primarily upon a well-specified regression model. Therefore, before any attempt to determine this rank or to present any estimation, the empirical analysis begins with specification and misspecification test. The specification and misspecification test based on the OLS residuals of the unrestricted model in equation (4.2) for the vector Y_t. We use, the most recommended, the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC) to select the lag length of the VAR system, which is achieved by minimizing the AIC and SBC.

2. Multivariate Granger Causality Tests

Apart from the examination of the long-run co-movements of the three variables of interest, we will explore the short-run dynamics by performing Granger causality tests for cointegrating systems. Such an exercise will provide an understanding of the interactions amongst the variables in the system and will shed light on the directions of the causality.

The concept of causality was initially defined by Granger (1969). Broadly speaking, in a bivariate framework, a time series x_{1t} Granger-causes another time series x_{2t} if series x_{2t} can be predicted with better accuracy by using past values of x_{1t} rather than by not doing so, other information is being identical. Testing causal relations between two series x_{1t} and x_{2t} (in bivariate case) can be tested on the following vector autoregressive process of order p.

$$\begin{bmatrix} x_{1t} \\ x_{2t} \end{bmatrix} = \begin{bmatrix} A_{10} \\ A_{20} \end{bmatrix} + \begin{bmatrix} A_{11}(L) & A_{12}(L) \\ A_{21}(L) & A_{22}(L) \end{bmatrix} \begin{bmatrix} x_{1t-1} \\ x_{2t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \tag{4.6}$$

Where A_{i0} are the parameters representing intercept terms and $A_{ij}(L)$ the polynomials in the lag operator. And $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})$ is an independently and identically distributed bivariate white noise process with zero mean and non-singular covariance matrix. In this process, if $A_{12}(L)$s are statistically significantly different from zero, either in individual coefficient or a subset of coefficients but $A_{21}(L)$ not, then it is said that x_{2t} is unidirectional Granger casual to x_{1t}. On the other hand, if $A_{21}(L)$s are statistically significantly different from zero, either in individual coefficient or a subset of coefficients, but $A_{12}(L)$ not, then it is said that x_{1t} is unidirectional Granger casual to x_{2t}. If

both $A_{12}(L)$ and $A_{21}(L)$ are statistically significantly different from zero, either in individual coefficient or a subset of coefficients in their respective equations, then it is bi-directional causality (feedback effect) between these two variables.

It may be mentioned that the above test is applicable to stationary series. In reality, however, underlying series may be non-stationary. In such cases, one has to transform the original series into stationary series and causality tests would be performed based on transformed stationary series. A special class of non-stationary process is the I(1) process (*i.e.* the process possessing a unit root). An I(1) process may be transformed into a stationary one by taking first order differencing. Thus, while dealing with two I(1) process for causality, equations (4.6) must be expressed in terms of differenced-series. However, if underlying I(1) processes are cointegrated; the specifications so obtained must be modified by inserting the lagged-value of the cointegration relation (*i.e.* error-correction term)[2] as an additional explanatory variable (Engle and Granger, 1987). According to Johansen's (1988), this evidence of cointegration among the variables rules out spurious correlations and also implies at least one direction of Granger causality.

However, Toda and Phillips (1993) provide evidence that the Granger causality tests in ECMs still contain the possibility of incorrect inference. They also suffer from nuisance parameter dependency asymptotically in some cases (see Toda and Phillips, 1993 for details). Therefore, their results are unreliable.[3] All of these indicate that there may be no satisfactory statistical basis for using Granger causality tests in levels or in difference V AR system or even in ECM. The sequential Wald tests of Toda and Phillips (1993) are designed to avoid these problems. Asymptotic theory indicates

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[2]This methodology involves transforming the suggested relationship into an Error Correction model (ECM) and identifies the parameters associated with causality. If the case involves more than two cointegration vectors, this is not easy work.

[3]Further, there is growing concern among applied researchers that the cointegration likelihood ratio (LR) test of Johansen (1998) and Johansen and Juselius (1990) have often not provide the degree of empirical support that might reasonably have been expected for a long-run relationship. Furthermore, using a Monte Carlo experiment, Bewley and Yang (1996) argue that the power of LR tests is high only when the correlation between the shocks that generate the stationary and non-stationary components of typical macroeconomic series is sufficiently large and also that the power of LR tests deteriorates rapidly with over-specification of lag length. This concern has also been supported by the simulation studies of Ho and Sorensen (1996).

that their limiting distributions are standard and free of nuisance. For this reason, we apply the Multivariate Granger causality methodology developed by Toda and Yamamoto (1995)[4] to test the causality among the variables in this paper.

The Advantage of using Toda and Yamamoto's techniques of testing for granger causality lies in its simplicity and the ability to overcome many shortcomings of alternative econometric procedures.

Toda and Yamamoto (1995) proposed a simple procedure requiring the estimation of an 'augmented' VAR, even when there is cointegration, which guarantees the asymptotic distribution of the MWald statistic. All one needs to do is to determine the maximal order of integration d_{max} (where d_{max} is the maximal order of integration suspected to occur in the system), which we expect to occur in the model and construct a VAR in their levels with a total of $(k + d_{max})$ lags. Toda and Yamamoto point out that, for $d = 1$, the lag selection procedure is always valid, at least asymptotically, since $k >= 1 = d$. If $d = 2$, then the procedure is valid unless $k = 1$. Moreover, according to Toda and Yamamoto, the MWald statistic is valid regardless whether a series is I(0), I(1) or I(2), non-cointegrated or cointegrated of an arbitrary order.

In order to clarify the principle, consider the simple example of a bivarite model, with one lag ($k = 1$). That is,

$$\begin{bmatrix} x_{1t} \\ x_{2t} \end{bmatrix} = \begin{bmatrix} A_{10} \\ A_{20} \end{bmatrix} + \begin{bmatrix} A_{11}^{(1)} & A_{12}^{(1)} \\ A_{21}^{(1)} & A_{22}^{(1)} \end{bmatrix} \begin{bmatrix} x_{1t-1} \\ x_{2t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \tag{4.7}$$

Here A_{i0} are the parameters representing intercept terms and $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t})$ is n independently and identically distributed bivariate white noise process with zero mean and non-singular covariance matrix.

To test that x_2 does not Granger cause x_i, we will test the parameter restriction $A_{12}^{(1)} = 0$. If now we assume that x_{1t} and x_{2t} are I(1), a standard t-test is not valid. We test $A_{12}^{(1)} = 0$ by constructing the usual Wald test based on least squares estimates in the augmented model:

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[4]However, this procedure does not replace the conventional hypothesis testing of unit roots and cointegration ranks. It should be considered as complementary the pre-testing method that may suffer inference biases (Toda and Yamamota, 1995).

$$\begin{bmatrix} x_{1t} \\ x_{2t} \end{bmatrix} = \begin{bmatrix} A_{10} \\ A_{20} \end{bmatrix} + \begin{bmatrix} A_{11}^{(1)} & A_{12}^{(1)} \\ A_{21}^{(1)} & A_{22}^{(1)} \end{bmatrix} \begin{bmatrix} x_{1t-1} \\ x_{2t-1} \end{bmatrix} = \begin{bmatrix} A_{11}^{(2)} & A_{12}^{(2)} \\ A_{21}^{(2)} & A_{22}^{(2)} \end{bmatrix} \begin{bmatrix} x_{1t-2} \\ x_{2t-2} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{bmatrix} \quad (4.8)$$

The Wald statistic will be asymptotically distributed as a Chi Square (χ^2), with degrees of freedom equal to the number of "zero restrictions", irrespective of I(0), I(1) or I(2), non-cointegrated or cointegrated of an arbitrary order.

V. EMPIRICAL FINDINGS

ORDER OF INTEGRATION

Before testing for co-integration, we tested for unit roots in order to investigate the stationarity properties of the data; Augmented Dickey-Fuller (ADF) t-tests (Dickey and Fuller, 1979) and (PP) Phillips and Perron (1988) tests are used for each of the three time series real GDP, real exports and real imports to test for the presence of a unit root. The lag length for the ADF tests was selected to ensure that the residuals were white noise.

The results of the Augmented Dickey Fuller (ADF) test with and without trend as recommended by Engle and Granger (1987) and the Phillips and Perron (1988) test again with and without trend are reported in Table 4.

TABLE 4

Stationary Test Results

Variable	ADF Test		PP Test	
	Without trend	With trend	Without trend	With trend
x	–0.242	–4.383*	–0.597	–4.391**
Δx	–6.438**	–6.302**	–8.118**	–8.949**
m	–2.888	5.936*	–2.8436	–5.850*
Δm	–9.421**	–9.222**	–9.253**	–8.972**
y	3.384	–0.752	–0.907	–3.679
Δy	–9.104**	–4.329**	–8.293**	–8.097**

Notes: ADF means Augmented Dickey Fuller Test and PP denoted Phillips Perron Test.

Δ denotes first difference. And ** (*) denotes significance at 1% (5%) level.

m, x and y denote the natural logarithms of Imports, Exports and Output, respectively.

Table 4 shows that the null of unit root cannot be rejected for any of the three level variables. However, the null of unit root is rejected for first differenced variables, indicating that all variables are first differenced stationary or integrated of order one, I(1).

TESTING FOR COINTEGRATION

Having established that all variables in the study are integrated of order one I(1), we proceed to test for cointegration between the variables on levels.

Two time series are cointegrated when a linear combination of the 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.

Before we run cointegration test, using the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC), the lag length for the VAR system is determined. The lags used by both criteria in the VAR are shown in Table 5. Moreover, since the data are of annual periodicity, an inspection of the results suggests that serial correlation is not a problem when we set the order of the VAR at suggested lags.

TABLE 5

Johansen Cointegration Test Results

(Variables: OUTPUT, EXPORTS and IMPORTS)
(lag = 2)

Null	Alternative	λ_{max} Statistics	Critical Value		Trace Statistics	Critical Value	
			5%	1%		5%	1%
$r = 0$	$r = 1$	31.19**	20.97	25.52	43.78**	29.68	35.65
$r \leq 1$	$r = 2$	10.76	14.07	18.63	10.56	15.41	20.04
$r \leq 2$	$r = 3$	1.81	3.76	6.65	1.81	3.76	6.65

Note: ** and * indicate significance at the 1% and 5%, respectively

The results of their λ-max and trace tests to identify the number of cointegrating vectors are reported in Table 5.

Note that Reinsel and Ahn (1992) argue that in model with a limited number of observations, the likelihood ratio tests can be biased toward finding cointegration 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. Table 2 reports these adjusted statistics.

Table 5 shows that the null of no cointegration is rejected using either statistics because both statistics are greater than their critical values. However, the null of at most one cointegrating vector cannot be rejected in favour of $r = 2$. Thus, the empirical support for one cointegration vector implies that all three variables, import, export and output, are cointegrated and follow a common long-run path. This is consistent with our "a priory" expectation that import, export and economic growth are inter-connected.

Table 6 presents the long-run equation, which is derived by normalizing on output based on estimated cointegration coefficient. All the coefficients are positive as expected, that is both exports growth and imports growth contributes to the economic growth for Bangladesh.

TABLE 6

Estimated Cointegration Coefficient Derived by Normalizing on Y

Constant	Export (x)	Import (m)
5.268	0.291 (0.044)	0.238 (0.056)

Note: Standard errors are in the parentheses.

Y = Output

MULTIVARIATE GRANGER CAUSALITY TEST

Since all of above tests confirm cointegration among these variables under study, therefore, the standard Granger causality test is no longer valid in these cases. Hence, we have used multivariate Granger Causality developed by Toda and Yamamoto (1995) to study short-run dynamics among exports growth, imports growth and real output growth.

The results from Table 4 clearly suggest that none of the variables are stationary in level. However, the first differences of these series are stationary. This means that $d_{max} = 1$ in our case. We then estimate a system of VAR in levels with a total of $d_{max} + k$ lags, where k equals to the lag length as shown in Table 5.

Using these information, the system of equations is jointly estimated as a "Seemingly Unrelated Regression Equations" (SURE) model by Maximum Likelihood and computes the MW ALD test statistic as shown in Table 7.

Table 7 shows that the null hypothesis that 'Granger no-causality from export to growth' can be rejected for at 5% level of significance and converse is also true. This shows that there is a feedback effect between exports and economic growth for Bangladesh.

Our results also show that the null hypothesis that 'Granger no-causality from imports to growth' can be rejected at 5% level. The null hypothesis that 'Granger no-causality from growth to imports' can also be rejected at 1% level of significance.

TABLE 7

Multivariate Granger Causality Test Results

Dependent Variable	Source of Causation		
	Output	Exports	Imports
	χ^2	χ^2	χ^2
Output	–	8.21**	8.43**
Exports	11.945***	–	7.62*
Imports	24.279***	26.840***	–

Notes: ***, ** and * indicate significance at the 1%, 5% and 10 % respectively.

These results indicate that in the process of development, it is crucial for developing countries such as Bangladesh to import some needed technology and input material to expand capacity to boost output. It is fact that in the process of growth, imports play important role through different channels. Imports of raw material increase the value added products and import of

necessary technology increase the productive capacity and productivity, which further enhances the growth rate of the economy. Imports generate employment especially in the handling and transportation sectors. It also creates employment indirectly in the wholesale and retail sectors, which positively affects the growth of the economy. Moreover, it also provides cheap products to consumers and unrestricted access to imports also supports by reducing the prices of essential production inputs. The overall effect of this is to increase growth which supports the increase demand of the imports. However, excessive imports of finished goods may replace the domestic output and displace the workers. How much employment will be effected is an empirical question that needs to be investigated.

Our Results show a strong evidence of significant causality between imports and exports in the case of Bangladesh.

VI. CONCLUSION

The importance of international trade and economic growth has been debated over the decades. The suitability of trade policy — import substitution or export promotion — for growth and development has been also debated in the literature. In 1950s and 1960s, most of the developing countries followed import substitution (IS) policy for their economic growth. Sincemid-1970s, most developing countries have been shifting towards export promotion strategy (EP). This approach postulates that export expansion leads to better resource allocation, economies of scale and production efficiency through technological development, capital formation, employment creation and hence economics growth. The export-led growth has been focus of the economic debate. However, results are found to be mixed in the literature.

This paper re-investigated the link between imports, exports and economic growth for Bangladesh. A vector autoregression (VAR) model applying the multivariate Granger causality procedure, developed by Toda and Yamamoto (1995), instead the traditional error correction mode (ECM) has been used to improve the Standard F-statistics in the causality test process and to test the causal link between the growth of exports, imports and thy real output growth.

The empirical results strongly support a long-run relationship among the three variables. Our results show a feedback effect between import and output growth in the short-run for Bangladesh. Study also finds feedback effects between exports and output growth for Bangladesh. Results also show evidence of a strong feedback effects between import and export of the country.

In the light of our results, we suggest that Bangladesh may continue with the imports of necessary raw material for value addition and needed technology to expand capacity and to improve productivity to increase output growth. It may also give full attention to boost up exports and thereby achieving higher economic growth.

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SOCIAL SECTOR EXPENDITURES AND OUTCOMES
A Case Study of the Punjab in the 1990s

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Abstract. Overall, Punjab's performance is better than that of the country as a whole. For one, Punjab's population growth rate, a vital determinant of quality of life and well being, has remained lower than Pakistan's population growth rate, while the economic growth rate has remained higher. In this article we will analyze social sector expenditures in terms of education and health and their outcomes on poverty levels and economic indicators for the Punjab. In the main, the poor social sector indicators it was found are due to inadequate spending on the social sectors and inefficiencies in implementation.

I. INTRODUCTION

Despite the Punjab's better performance as compared to the country as a whole, the incidence of poverty is still high and inequality is the highest in the entire country. In this paper we examine whether overall social sector expenditures determine the poverty status of the people. Are the province's abysmal social indicators a result of low spending on the social sector and inefficiencies in the use of these limited resources?

There are no studies for Pakistan/Punjab that tests the relationship of social sector expenditures and poverty. The poverty reduction paradigm of 1990 put forward by the World Bank stressed growth, social sector

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development and safety nets as three legs of the essential poverty reduction strategy. Employment is the essential mechanism for the growth of incomes of the poor and social sector expenditures determine the socio-economic position. Hence, a focus in these two elements is a means of giving context to and assessing the two important ingredients of the poverty reduction strategy as propounded by the World Bank.

Despite the paucity of data that exists, fairly comprehensive figures were gleaned from sources such as the World Bank, Federal Bureau of Statistics and Federal and Provincial Budgets. Most of the literature that exists is for all-Pakistan, and relatively little is available that is Punjab-specific. Perhaps the World Bank and Asian Development Bank have carried out the most research and reported on this province.

The fiscal policies of Pakistan as a whole, and this applies equally to the Punjab, do not reflect the need for improving social indicators. Per capita health expenditure, for instance, is currently only $ 2 – well below regional and international levels (World Bank, 2002). This is partly due to the constraints imposed by the country's enormous debt burden and unusually high defense expenditures which obviously also impact on the province's finances. Social spending in all four provinces appears to have borne the brunt of the adjustments to these expenditures.

A recent World Bank study of local public expenditures for the Punjab has highlighted the critical importance of the nature and quality of public spending in determining social indicators (World Bank, 2002). The study also indicates that the province's poor social indicators are a result not only of low spending on the social sector, but also because of inefficiencies in the use of the limited resources that exist.

In this paper we will first look at trends in the money-metric measure of poverty, inequality in the Punjab, followed by a section on the dimensions of poverty for the province. Social indicators in terms of education and health as the most important components of the quality of life, are then analyzed and the province's expenditures on these sectors. The paper concludes with certain policy recommendations on how to overcome the malaise of poverty in the Punjab.

II. BACKGROUND

Despite persisting pockets of poverty, the Punjab province is the most developed of Pakistan's four Provinces. And given its considerable size in the overall economy, it is small wonder that trends in this province determine the direction and pace of trends overall. Punjab's economy grew at an

average rate of 6.4 percent per annum during the 1980s as compared to 5.9 percent per annum for the country as a whole. When Punjab's growth decelerated during 1990/91 to 1994/95 to 4.9 percent, Pakistan's overall growth reflected this and slowed down to 4.0 percent per annum. It can be said that Punjab's performance is better than that of the country. Considering growth per capita, the Province has fared better than the country as a whole.

TABLE 1

Economic Indicators – Punjab and Pakistan

	1984/85 to 1990/91		1990/91 to 1994/95		1994/95 to 1999/00	
	Punjab	Pakistan	Punjab	Pakistan	Punjab	Pakistan
Population growth rate	2.65	3.00	2.60	2.61	NA	2.25
Average Annual GDP growth rate	6.4	5.9	4.9	4.0	NA	3.7
Average annual growth of budgetary expenditure	16.3	14.3	11.8	14.7	9.1	10.1
Average annual growth of own revenue	9.5	14.2	9.5	17.9	13.5	9.6
	1984/85		1994/95		1999/00	
Average per capita GDP	312	328	507	499	NA	447
Total expenditure/GDP	7.8	24.2	7.4	25.3	NA	22.9
Own tax and non-tax revenue/GDP	1.9	16.2	1.1	17.0	NA	16.5

Source: World Bank, 2001.

There are certain reasons which can be attributed to the higher growth in Punjab. The law and order problem in Karachi during much of the decade resulted in a shift of economic activity to Punjab. Secondly, Punjab's healthier and more diversified economic base than those of the two smaller provinces of NWFP and Balochistan, as well as the good cotton crop in the early 1990s as Punjab is a major producer of cotton and also has a sizeable downstream textile industry.

With the slowing down of economic growth during the 1990s, poverty reduction was adversely affected. The incidence of poverty increased and social indicators across the entire country worsened. Punjab followed this line of exacerbating poverty. In terms of certain social indicators, Punjab has

fared more poorly than the national averages. For instance, the infant mortality rate at 95 per thousand, is higher than the national average of 89 per thousand. The contraceptive prevalence ratio is lower in this province when compared to the whole of Pakistan. However, gross primary enrolment rate and literacy rates are better in the Punjab than national levels (Malik, 2004).

The available information on poverty in Punjab is succinctly presented below. An aside on the data sources of the tables is worthy of mention here. As the breakdown and categories of the data in the Report on the Punjab prepared by Malik (2004) and used in this analysis (in quintiles) is different from and not consistent with that presented in the *Pakistan Social and Living Standards Measurement Survey* 2004-05 (PSLM), additional tables have been provided to supplement the analysis. The PSLM is intended to be one of the main mechanisms for monitoring the implementation of the PRSP. It supposedly provides a set of representative, population-based estimates of social indicators and their progress under the PRSP. However, in assessing the quality and worth of the data, it should be kept in mind that the field work for the Survey was carried out between September 2004 and March, 2005, a relatively short period. This leads one to question the validity, representativeness and reliability of the data.

Before attempting to understand and analyze the reasons for the persisting poverty in the province, it would be worthwhile to look at the trends in poverty by province in terms of the money-metric measure.

III. TRENDS IN MONEY-METRIC MEASURE OF POVERTY

Going by the available information on the headcount of poverty based on the Household Income and Expenditure Surveys (HIES) data, poverty in the Punjab increased markedly during the latter part of the 1990s. This increasing trend of poverty in terms of the money-metric measure is applicable both to the urban as well as rural areas. The incidence of poverty however is less than that of NWFP and Balochistan.

On the whole, the overall picture of consumption/income poverty in the Punjab tallies closely with the national picture with a higher concentration of the poor in rural areas. The over 10 percentage point rural-urban gap in headcount rates for Punjab in 1998-99 is in line with the pattern for the country as a whole. In urban areas of the Punjab poverty went up considerably in FY 99. In that year unemployment and under-employment

increased and numerous labour intensive sectors such as construction, transport and manufacturing grew sluggishly (Malik, 2004).

It is worthwhile mentioning at this point that more recent data from the Household and Expenditure Survey have not been released by the government and there is much controversy brewing about the authenticity and reliability of the 2000-01 Survey.

TABLE 2

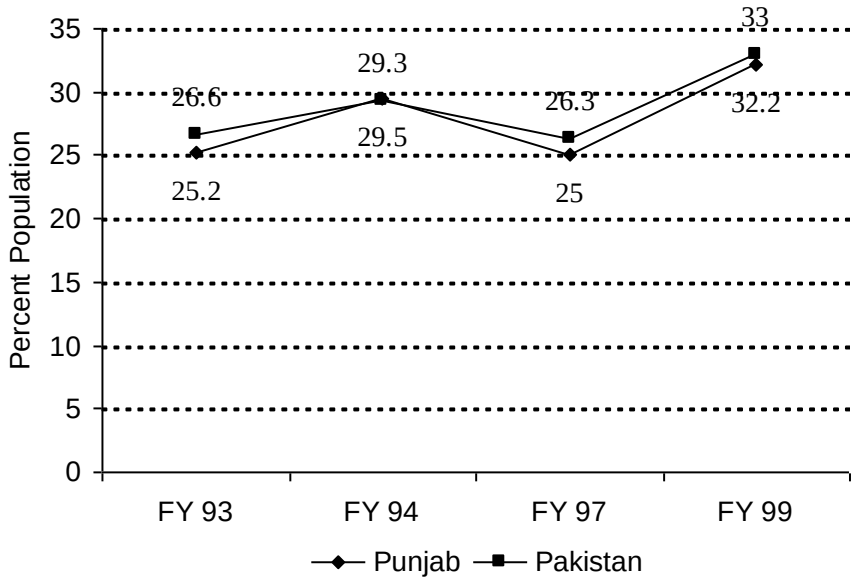
Poverty Trends by Province

Province	FY 93	FY 94	FY 97	FY 99
Urban Areas	20.7	16.3	16.1	22.4
Punjab	22.0	18.1	16.9	25.5
Sindh	17.3	11.8	12.0	16.1
NWFP	25.3	26.9	27.2	29.2
Balochistan	31.8	16.8	23.0	24.3
Rural Areas	28.9	34.7	30.7	36.3
Punjab	26.5	33.9	28.3	36.0
Sindh	29.5	31.8	19.6	34.7
NWFP	37.0	40.0	43.4	44.9
Balochistan	28.1	37.9	42.5	22.5
Overall	26.6	29.3	26.3	32.2
Punjab	25.2	29.5	25.0	33.0
Sindh	24.1	22.6	15.7	26.6
NWFP	35.5	38.1	41.2	42.6
Balochistan	28.6	35.5	38.4	22.8

Source: ADB (2002), *Poverty in Pakistan*: *Issues, Causes and Institutional Responses*.

A comparison of poverty trends in the Punjab with those of Pakistan as a whole attests to the fact that poverty in the Punjab has generally been lower than at the overall level. This is portrayed in Figure 1. However, in 1999 this level became higher than the national estimates.

FIGURE 1



In the Figure 1 above, Series 1 represents the Punjab statistics while Series 2 is for all Pakistan.

TABLE 3

Poverty Headcount, Poverty Gap and Severity of Poverty in Punjab During the 1990s by Region

Region	FY 93			FY 94			FY 97			FY 99		
	P0	P1	P2	P0	P1	P2	P0	P1	P2	P0	P1	P2
Urban areas	21.98	3.92	1.02	18.14	3.39	0.9	16.93	2.68	0.70	25.50	5.29	1.67
North Punjab	9.95	1.36	0.28	9.66	1.57	0.43	13.27	1.70	0.42	12.77	2.17	0.61
Central Punjab	25.61	4.67	1.23	23.71	4.71	1.32	15.87	2.42	0.64	24.50	5.06	1.61
South Punjab	27.97	5.24	1.42	17.81	3.13	0.78	21.70	3.86	1.00	35.33	7.64	2.39
Rural areas	26.45	4.66	1.2	33.85	6.79	2.0	28.28	5.03	1.35	36.00	7.87	2.52
North Punjab	10.49	1.68	0.39	29.27	6.33	2.36	21.44	3.04	0.68	29.31	4.76	1.14
Central Punjab	27.94	4.75	1.21	31.60	6.08	1.69	26.17	4.71	1.26	34.52	7.50	2.36
South Punjab	33.24	6.46	1.84	41.08	8.69	2.66	32.87	5.97	1.65	39.74	9.20	3.11
Overall	25.3	4.46	1.17	29.51	5.85	1.71	25.03	4.35	1.17	32.97	7.13	2.27
North Punjab	10.28	1.55	0.34	19.14	3.87	1.37	19.04	2.65	0.60	24.38	3.99	0.98
Central Punjab	27.45	4.74	1.21	29.93	5.79	1.61	22.63	3.92	1.05	30.99	6.64	2.09
South Punjab	31.57	6.07	1.71	34.59	7.14	2.13	30.73	5.57	1.53	38.93	8.92	2.98

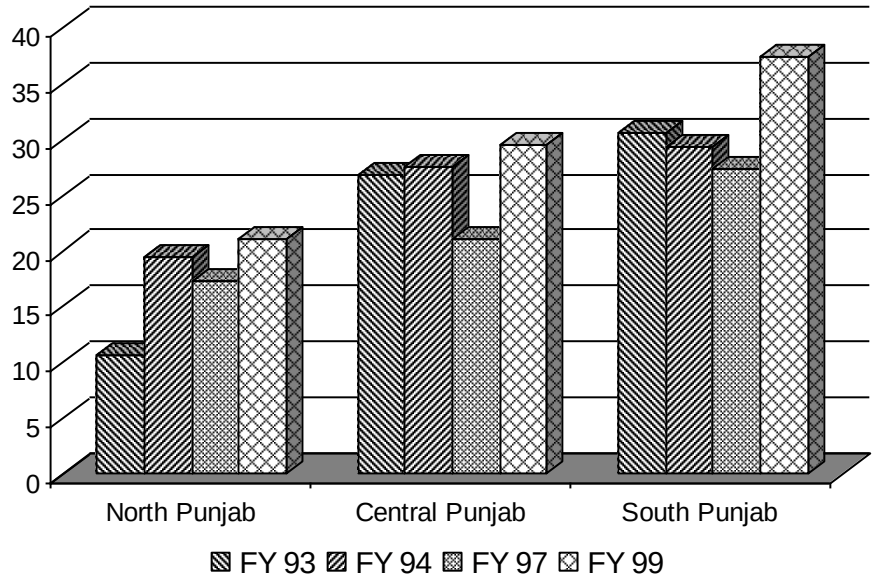
Source: Government of Pakistan, *Pakistan Economic Survey*, Various issues. Finance Division, Economic Advisor's Wing, Islamabad.

Note: P0: Poverty headcount; P1: Poverty gap; P2: Severity of poverty

The Federal Bureau of Statistics (2001) divided Punjab into three regions: Northern Punjab (including Islamabad, Rawalpindi division and the district of Mianwali), Central Punjab (including Sargodha, Faisalabad, Gujranwala and Lahore divisions), and Southern Punjab (including Multan, Dera Ghazi Khan and Bahawalpur divisions) and found substantial differences in poverty levels in these three regions. The incidence of poverty is consistently the lowest in Northern Punjab and reaches its highest in Southern Punjab, both for rural and urban areas (*see* Table 1.3 and Figure 2). In FY 99, urban poverty touched the highest mark in the country in Southern Punjab (35%) which was almost three times greater than the level in Northern Punjab. It was found that urban areas in Northern Punjab had the lowest level of poverty (29%) among the rural areas of the country. Poverty in rural areas of Southern Punjab (39%) and rural Central Punjab (35%) was markedly higher than overall national poverty.

FIGURE 2

Poverty Trends in Different Regions of Punjab – Poverty Headcount



Source: Asian Development Bank (2002)

It is of interest indeed and an apparent anomaly that Northern Punjab projects the lowest levels of poverty, has lowest per capita cultivated land and does not have any irrigation. While Southern Punjab, despite having the highest per capita cultivated land and 100 percent irrigation is one of the

poorest regions of the country. One reason for this seeming 'absurdity' is that rural areas in Northern Punjab are closely knit with their urban centers and have strong linkages with the services sector. Also the people of the region have for long been employed in the public sector, especially in the armed forces. On the other hand, Southern Punjab is the least urbanized region in the province, and mobility of the people in the quest of employment outside the region or overseas has also been limited. The World Bank (2002) also concluded that the highest incidence of vulnerability, chronic and transient poverty is in the southern irrigated plains of Punjab and Sindh, and the lowest in the northern irrigated regions of the Punjab.

Across rural-urban areas, Table 3 shows that the incidence of poverty in the urban areas of southern Punjab has gone up from 21.7 percent to 35.3 percent during FY97-FY99. The major reason for this hike is the badly affected cotton-based manufacturing industries in the region. According to an estimate, the cotton production in Multan Division in FY 98 was only 64 percent of FY96 levels. Added to this was the decline in job opportunities and increasing incidence of unemployment in urban areas, a considerable decline in domestic remittances exacerbating the situation further.

In rural areas, the incidence of poverty is closely tied in with shocks in agriculture. For instance, the agricultural sector witnessed a negative growth rate (–5.29%) in 1992-93 and considerably low growth in 1996-97 (0.12%) and 1998-99 (1.95%). The fundamental reason for this slow growth was the fall in the production of major crops, especially the production of cotton which declined to 1368 tons in 1993-94 from 2181 thousand tons the previous year. The years 1996-97 and 1998-99 also saw a fall in cotton production. A similar trend of poverty incidence can be seen in all the three regions of the Punjab in Table 3.

IV. INEQUALITY IN PUNJAB

The 1990s show an increase in inequality with the highest Gini coefficient in 1998-99. It is in the Punjab that inequality is the highest as compared to the other provinces. This applies both to urban and rural sectors. Table 4 below shows the available estimates of the Gini coefficient (expressed as a percent) of consumption expenditures. Table 4 indicates that inequality is higher in Punjab and Sindh relative to NWFP and Balochistan. In the Punjab, inequality in urban areas is far greater than in rural areas. The Gini coefficient for urban Punjab is around 12 percent higher than rural Punjab.

TABLE 4

Inequality (Gini): Mean Per Equivalent Adult Expenditure – 1998-99

	Punjab	Sindh	NWFP	Balochistan	Pakistan
Urban	37.0	33.0	34.6	25.5	37.0
Rural	25.7	24.6	24.5	22.5	25.7
Overall	30.6	30.4	27.1	22.9	30.6

Source: World Bank (2002)

It is both of interest and important to analyze inequality in the three regions of the Punjab. Table 5 reports the Gini coefficient for the 1990s by regions of the Punjab. The table shows that inequality remained higher in northern Punjab and it reached a peak in 1998-99 at 42.76%. In Northern Punjab, foreign and domestic remittances are the major source of income for most of the people. During the 1990s, the number of households receiving remittances declined in contrast with a higher median value of their amounts. Such trends in remittances have played an important part in increasing inequality in northern Punjab during the 1990s. Also another point of interest is that although southern Punjab has a level of poverty like that of NWFP and Balochistan, its inequality level is higher. Overall the prognosis is that inequality is on the rise in the richer areas of the country.

TABLE 5

Gini Index of Inequality for Punjab During the 1990s

Region	FY 93	FY 94	FY 97	FY 99
Overall Punjab	27.22	27.97	26.37	30.99
North Punjab	37.41	37.17	37.96	42.76
Central Punjab	29.80	31.82	28.07	35.58
South Punjab	30.83	34.25	30.82	31.03

Source: Federal Bureau of Statistics (2001)

Since the Province depends heavily on agriculture as a source of income and employment – agriculture accounts for 25 percent of Punjab's GDP and 37 percent of the employed labor force – its vital role in the determination of poverty and the prospects of its reduction is amply apparent.

It is important next, in this context, to give an overview of Punjab's main dimensions of poverty as a backdrop to assessing the underlying causes.

V. POPULATION GROWTH AND KEY CHARACTERISTICS OF THE PUNJAB

As stated earlier, population and its growth are the vital determinants of overall welfare of the province. Punjab is the second largest province in terms of area and the largest in terms of its population. According to the Population Census 1998, 355 persons live within an area of one square kilometer in the Punjab. The figure was 100 in 1951 depicting an increase in population density by 252 percent since that year. The annual rate of population growth is 2.64 percent since 1981. If the growth rate is maintained at this level, the population of the province will double by the year 2026. Punjab is the second most urbanized province of the country after Sindh. Its urban population has gone up from 17 percent in 1951 to 31 percent in 1998.

HOUSEHOLD COMPOSITION AND DEMOGRAPHICS

The data of the Population Census (1998) indicates that 42.52 percent of the province's population was less than 15 years, and among them 2.41 percent were younger than one year; 14 percent were less than 5 years. The proportion of women between the ages of 15-49 years was 22 percent. The crude birth rate was 33.8 percent per 1000 live births, the total fertility rate was 4.8 per woman, the contraceptive prevalence rate was 30 percent and infant mortality rates were observed as 89 per 1000 births in the Punjab.

Quite obviously household composition and demographic indicators differ between poor and non-poor households. According to Qureshi and Arif (2001), household size is positively associated with the incidence of poverty. Large households are more likely to be poor than small ones. Table 6 portrays household size and composition in the Punjab during 2001-02 for the various income quintiles.

The first quintile covers 20% lowest level of income of the total households. The second quintile has the next better income level and so on. The richest 20% households are covered in the fifth quintile.

The average household size shows a decreasing trend from the 1st quintile to the 5th quintile. It gives the understanding that the richest households have comparatively low family size as compared to the middle class and poor households.

TABLE 6

Average Household Size and its Composition in Punjab by Sex and Quintiles, 2001-02

Punjab	Total	1st quintile	2nd quintile	3rd quintile	4th quintile	5th quintile
Household size	100	15.42	16.44	18.22	22.13	27.80
Average number of members per household	6.54	8.12	7.39	6.91	6.11	5.24
Male	3.26	4.06	3.66	3.46	3.08	2.61
Female	3.27	4.06	3.73	3.45	3.04	2.63
Average number of adults (male above 18 years)	1.65	1.74	1.70	1.70	1.65	1.53
Female (above 16 years)	1.84	1.95	1.89	1.92	1.80	1.74
Children	3.05	4.43	3.80	3.29	2.66	1.98
Urban areas – % of households	100	11.38	11.04	15.92	21.71	39.95
Rural areas – % of households	100	17.02	18.59	19.13	22.29	22.97

Source: Government of Pakistan, *Pakistan Integrated Household Survey* (2001-02)

For further analysis, we see the differences in household size between rural and urban areas. The differences of household size between rural and urban areas are statistically significant. Punjab has shown a slight increase in the household size compared to the year 1998-99.

SOCIAL INDICATORS

Income and expenditure indicators of poverty alone do not provide a complete picture of poverty unless they are complemented by non-poverty measures. Some of the latter include gross enrolment ratio, literacy level, health, etc.

Education

There is no arguing the fact that the performance of the education sector has remained grossly lacking in Pakistan. There are vast gender and rural urban differences in education. Table 7 below reports the gross primary enrolment rate of the Punjab for the various quintiles for both urban and rural areas.

TABLE 7

Gross Primary Level Enrolment Rate
(Excluding Katchi Class – by Income Group)

Income Group	Urban Areas			Rural Areas		
	Male	Female	Both	Male	Female	Both
1st quintile	59	57	58	55	39	47
2nd quintile	94	75	83	68	53	61
3rd quintile	111	94	102	95	61	77
4th quintile	108	109	109	99	80	90
5th quintile	109	120	114	109	88	99

Source: Government of Pakistan Federal Bureau of Statistics, *Pakistan Integrated Household Survey*, 2001-02

The gross enrolment rate is the number of children attending primary level (Class 1 to 5) divided by number of children aged 5 to 9 multiplied by 100. Gross enrolment rates are lower for the first quintile (that is poor households). The difference is quite substantial between rural and urban areas in the Punjab.

TABLE 8(a)

Gross Enrolment Rate at the Primary Level (Age 5-9 Years)
(Excluding Katchi Class)

Region and Province	Gross Primary Level Enrolment Rate 2004-05		
	Male	Female	Both
Urban Areas	107	100	104
Punjab	111	108	110
Rural Areas	89	68	79
Punjab	96	82	89
Overall	94	77	86
Punjab	100	89	95

Gross Enrolment Rate: [Number of children attending primary level (classes 1-5) divided by number of children aged 5-9 years] multiplied by 100. Enrolment in katchi is excluded.

Source: *Pakistan Social and Living Standards Measurement Survey* (2004-05).

TABLE 8(b)

Gross Enrolment Rate at the Primary Level (Age 6-10 Years)
Excluding Katchi Class

Region and Province	Gross Primary Level Enrolment Rate 2004-05		
	Male	Female	Both
Urban Areas	104	97	100
Punjab	108	104	106
Rural Areas	88	68	79
Punjab	95	81	88
Overall	92	76	85
Punjab	99	87	93

Gross enrolment rate: [Number of children attending primary level (classes 1-5) divided by number of children aged 6-10 years] multiplied by 100.

Source: *Pakistan Social and Living Standards Measurement Survey* (2004-05).

Education commands a relatively large share of the overall PRSP budget. The PRSP strategy for the sector includes, improving the functioning, utilization of existing schools, improving the quality of education, increasing enrolment, improving access to education and expanding the primary education system (PSLM, 2004-05). As can be seen from Tables 8(a) and 8(b), the Gross Enrolment Rates (GERs) as a whole are far better for boys than for girls. As a whole the GERs has shown a considerable increase over the years.

There exist wide disparities also across income (employing expenditure as a proxy for income). Table 9 provides information on the proportion of population that has ever attended school disaggregated by expenditure quintiles in 2001-02. The table also shows the wide gender and rural-urban disparities. Marked gender differences can be seen across expenditure groups. The disparity is higher in rural areas. The segment of population ever attended school is higher and gender difference is lower in the higher expenditure groups.

Pakistan's literacy rate in 2001-02 was 48 percent; 60 percent for males and 34 percent for females. In Punjab this rate was 49%. The female literacy rate is abysmally low in the rural areas of Punjab (26%), while for urban areas it is 60%. Table 10 shows literacy rates in Punjab by expenditure groups. According to this table, the literacy rate of the lowest expenditure

quintile is more than half as compared to the highest expenditure group. The gap is considerably vast in rural areas. A distinct gender difference in rural areas can be seen from Table 10.

TABLE 9

Population that has Ever Attended School – by Expenditure Quintile
(Punjab – 2001-02)

Expenditure quintile	Percentage of population 10 years and older					
	Urban Areas			Rural Areas		
	Male	Female	Both	Male	Female	Both
1st Quintile	55	42	48	48	18	33
2nd Quintile	65	52	59	56	23	39
3rd Quintile	77	61	69	64	28	46
4th Quintile	80	66	73	66	35	50
5th Quintile	91	78	85	76	47	61
Overall	78	64	71	62	30	46

Source: Government of Pakistan, *Pakistan Integrated Household Survey* (2000-01)

TABLE 10

Literacy Rate – Population 10 Years and Older – by Expenditure Quintile
(Punjab)

Expenditure quintile	Urban areas			Rural areas			Overall		
	Male	Female	Both	Male	Female	Both	Male	Female	Both
1st Quintile	41	35	38	36	13	24	37	19	28
2nd Quintile	54	46	50	42	19	30	45	24	34
3rd Quintile	67	55	61	51	23	37	55	32	44
4th Quintile	73	62	68	55	29	42	61	39	50
5th Quintile	89	77	83	66	42	54	76	57	66
Overall	71	60	66	50	26	38	57	36	46

Source: Government of Pakistan, *Pakistan Integrated Household Survey* (2000-01).

Note: Literacy is defined as the ability to read a newspaper and to write a simple letter

There exist wide disparities also across income (employing expenditure as a proxy for income). Table 11 provides information on the proportion of population that has ever attended school disaggregated by expenditure quintiles in 2001-02. The table also shows the wide gender and rural-urban disparities. Marked gender differences can be seen across expenditure groups. The disparity is higher in rural areas. The segment of population ever attended school is higher and gender difference is lower in the higher expenditure groups.

TABLE 11

Population that has Ever Attended School – by Expenditure Quintile
(Punjab – 2001-02)

Expenditure quintile	Percentage of Population 10 Years and Older					
	Urban Areas			Rural Areas		
	Male	Female	Both	Male	Female	Both
1st Quintile	55	42	48	48	18	33
2nd Quintile	65	52	59	56	23	39
3rd Quintile	77	61	69	64	28	46
4th Quintile	80	66	73	66	35	50
5th Quintile	91	78	85	76	47	61
Overall	78	64	71	62	30	46

Source: Government of Pakistan, *Pakistan Integrated Household Survey* (2000-01).

Pakistan's literacy rate in 2001-02 was 48 percent; 60 percent for males and 34 percent for females. In Punjab, this rate was 49%. The female literacy rate is abysmally low in the rural areas of Punjab (26%) while for urban areas it is 60%. Table 12 shows literacy rates in Punjab by expenditure groups. According to this table, the literacy rate of the lowest expenditure quintile is more than half as compared to the highest expenditure group. The gap is considerably vast in rural areas. A distinct gender difference in rural areas can be seen from Table 12.

TABLE 12

Literacy Rate – Population 10 Years and Older – by Expenditure Quintile (Punjab)

Expenditure quintile	Urban areas			Rural areas			Overall		
	Male	Female	Both	Male	Female	Both	Male	Female	Both
1st Quintile	41	35	38	36	13	24	37	19	28
2nd Quintile	54	46	50	42	19	30	45	24	34
3rd Quintile	67	55	61	51	23	37	55	32	44
4th Quintile	73	62	68	55	29	42	61	39	50
5th Quintile	89	77	83	66	42	54	76	57	66
Overall	71	60	66	50	26	38	57	36	46

Source: Government of Pakistan, *Pakistan Integrated Household Survey* (2000-01).

Note: Literacy is defined as the ability to read a newspaper and to write a simple letter.

The literacy rate for the population 10 years and above increased from about 46 percent to 53 percent during 2001-02 and 2004-05 (Tables 12 and 13) Literacy is much higher in urban areas as compared to rural areas and much higher among men than women.

TABLE 13

Literacy – Population 10 Years and Older

Region and Province	Percentage of Population 10 Years and Older – Literate 2004-05		
	Male	Female	Both
Urban Areas	78	62	71
Punjab	78	62	72
Rural Areas	58	29	44
Punjab	59	35	47
Overall	65	40	53
Punjab	65	44	55

Population aged 10 years and older that is literate expressed as a percentage of the population aged 10 years and older.

Source: *Pakistan Social and Living Standards Measurement Survey* (2004-05).

Gross enrolment rates at primary, middle and higher levels are given in Table 14. Across expenditure quintiles, it is apparent that extremely wide disparities between lowest and highest expenditure groups exist at the higher level. It is of interest that female enrolment at the middle level in urban areas is higher than that of rural areas. The table indicates a very low enrolment for girls at the higher level in 2001-02. For the highest expenditure quintile, female enrolment is found to be higher in rural areas as well.

TABLE 14

Gross Primary, Middle and Matric Level Enrolment Rate
by Expenditure Quintile

Expenditure Quintile	Urban areas			Rural areas		
	Male	Female	Both	Male	Female	Both
Gross Primary Level Enrolment						
1st Quintile	59	57	58	55	39	47
2nd Quintile	94	75	83	68	53	61
3rd Quintile	111	94	102	95	61	77
4th Quintile	108	109	109	99	80	90
5th Quintile	109	120	114	109	88	99
Middle Level Enrolment Rate						
1st Quintile	20	36	29	22	8	15
2nd Quintile	45	59	52	31	22	27
3rd Quintile	48	75	60	44	21	34
4th Quintile	53	92	72	54	39	47
5th Quintile	94	88	91	65	70	67
Matric Level Enrolment Rate						
1st Quintile	31	27	29	16	4	10
2nd Quintile	33	52	42	23	12	17
3rd Quintile	50	53	51	43	13	28
4th Quintile	94	51	68	62	24	42
5th Quintile	119	94	106	89	52	72

Source: Government of Pakistan, *Pakistan Integrated Household Survey* (2000-01)

Note: Gross enrolment rate at primary level is calculated as number of children attending primary level (class 1 to 5) divided by number of children aged 5 to 9 years, multiplied by 100. This excludes *katchi* class.

Gross enrolment rate at middle level is calculated as number of children attending middle level (class 6 to 8) divided by number of children aged 10 to 12 years, multiplied by 100; Gross enrolment rate at matric level is calculated as number of children attending matric level (class 9 to 10) divided by number of children aged 13 to 14 years, multiplied by 100.

TABLE 15

Gross Enrolment Rate for Government Primary Schools (Age 5-9) Excluding Katchi Class

Region and Province	Gross Primary Level Enrolment Rate 2004-05 PSLM		
	Male	Female	Both
Urban Areas	55	53	54
Punjab	49	51	50
Rural Areas	73	56	65
Punjab	74	63	69
Overall	68	55	62
Punjab	67	60	64

Gross enrolment rate in government primary schools: [Number of children attending government primary schools (classes 1-5) divided by number of children aged 5-9 years] multiplied by 100.

Source: *Pakistan Social and Living Standards Measurement Survey* (2004-05).

Table 15 shows the gross enrolment rate in government primary schools. It is calculated as the number of children enrolled in government primary schools divided by the number of children of primary school age. The PSLM shows an increase in this measure, over the period implying that the coverage of the public school system has increased since 2001-02 from 54 to 62.

The problem in public service delivery can be linked to the fact that in the competition for the allocation of public spending, social spending has been squeezed. It is amply apparent from the preceding discussion that the educational indicators of the province leave much to be desired. Educational development is among the most valuable benefits of human development because it is an important determinant of whether someone living in poverty is likely to improve their living conditions. The fact that the spread of education has been sluggish and with wide disparities over the 1990s is a serious cause of concern.

What, in the main accounts, for the poor education indicators? An attempt will be made in the following section to analyze this.

Expenditure on Education

According to a World Bank study on local public expenditures, the main reasons for the province's abysmal social indicators are: low spending on the social sector and inefficiencies in the use of these limited resources. Punjab allocates almost 2.1% of its GDP to education and that is only about half of the share allocated by countries with similar levels of incomes and around two-thirds of what is spent in India and Sri Lanka. The Social Action Program intended to explicitly boost expenditures, yet average real spending per student was stagnant at best during the 1990s.

TABLE 16

Percentage Share of Expenditure on Education in Total Expenditure

		Percentage share in total expenditure of education					
	Education (Total)	Primary education	Secondary education	University education	Profes-sional education, teacher's training	Others	Growth rate in expendi-ture on education
1990/91	21.95	10.97	5.64	2.17	1.89	1.28	
1991/92	22.81	12.24	5.54	1.57	1.75	1.70	15.34
1992/93	22.99	11.69	5.55	2.33	2.16	1.27	9.45
1993/94	26.74	13.95	6.69	2.53	1.95	1.62	15.47
1994/95	25.04	13,42	6.18	2.15	1.16	2.12	22.10
1995/96	23.90	13.03	6.00	2.18	1.09	1.60	12.29
1996/97	24.93	13.36	6.35	2.33	1.21	1.68	0.72
1997/98	27.92	16.31	6.40	2.37	1.11	1.72	18.88
1998/99	25.59	14.57	6.02	2.25	1.21	1.54	–1.12
1999/00	22.26	13.22	5.53	2.13	0.41	0.98	3.47
2000/01	23.54	13.37	6.23	2.15	0.59	1.20	6.35
2001/02	25.33	14.39	6.43	2.32	0.61	1.57	7.60
2002/03	25.19	14.50	6.11	2.51	0.64	1.44	–0.5

Source: World Bank Database, 2004/05

The share of expenditure on education in total expenditure is given in Table 16. This table indicates that during 1990-91 to 2002-03, the share of expenditure on education increased from 22 percent to 25 percent. The share was at a peak in 1997-98 (27%). In that year highest expenditure was allocated to primary education. The expenditure on education shows a fluctuating growth rate during the period. From 1993-94 to 1994-95, educational expenditure grew at the highest rate (22%) and over 1997-98 to 1998-99, a negative growth rate has been witnessed. The decline was because of a fall in expenditure on primary education. World Bank (2001) states 'the amount allocated to non-salary inputs such as teaching materials, a critical determinant of school quality, has also remained very low — in 1997-98, 97% of the elementary education budget was spent on teacher salaries.' Moreover, restrictions on the use of non-salary budget — particularly withholding funds from School Management Committees (SMCs) that do not have a member trained in the use of public funds — have resulted in under-spending of the already limited budget allocations for non-salary expenditures.

The *Household Income and Expenditure Surveys* report household expenditure on education. The Surveys indicate that expenditure on education has remained virtually stagnant and very low not just in Pakistan but in all the provinces. In 1998-99, the share of household expenditure on education in the Punjab was 3.57 percent; 2.32 percent in rural areas and 5.48 percent in urban areas. This points to the sorry state that individual households perhaps do not value education highly or are trapped at such low levels of poverty that they can put very little aside for education. Alternatively the problem could be supply related. The government is the sole significant supplier of education at the national level.

The relative lack of attention to social spending in Pakistan has had particularly adverse consequences for the poor, since social services tend to benefit the poor disproportionately. Punjab province is a macrocosm of what the World Bank terms the 'social gap' in the country. Punjab's educational budget, at about 2.1% of provincial GDP, is, as mentioned earlier, only about half the share allocated by countries with similar incomes, and about two-thirds of what is spent in neighboring India and Sri Lanka. Actual spending is even less than these budget targets indicate, falling short by as much as a quarter in recent years. Average real spending per student was stagnant during the 1990s. The amount allocated to non-salary inputs such as teaching materials, a critical determinant of school quality, has also remained very low.

Another vital ingredient of human development is health. While various health indicators in the Punjab and Pakistan as a whole have shown some improvement since the beginning of the decade, enormous challenges remain. In the following section we discuss the health scenario of the province and then continue to attempt to analyze why the health indicators are as poor as they are.

Health

The government health strategy focuses on young children and their mothers particularly in rural areas. The main emphasis is to improve women's access to government health care. The government's strategy for primary health care includes:

- improving the efficiency and utilization of basic health care services, both preventive and curative;
- improving program design by paying more attention to quality;
- increasing access to health care by constructing more facilities; and
- increasing women's access by recruiting more female staff.

Such noble intentions notwithstanding, the prevailing conditions of health care, particularly public health care, remains pathetic and abysmal.

As is applicable to most parts of the country, the health status in Punjab is far from satisfactory. The number of maternal deaths in the province was estimated at 833 per month in 1998. Immunization coverage based on record fell from 37 percent in 1995-96 to 33% in 2001-02. This percentage is 57 percent on the basis of record and recall and 97 percent on the basis of recall. There are vast variations across districts. Table 17 presents the difference between the various income quintiles with respect to child immunization. The percentage of children fully immunized in the Punjab in 2001-02 was 23 percent 23 percent for the 1st quintile and 46 percent for the 5th quintile. As is to be expected, in urban areas the proportion of fully immunized children for the poor households is less than the proportion of rural areas. As concerns child immunization, the difference between the 1st quintile and 5th quintile in urban areas is greater.

Expanding the coverage of immunization in Pakistan is a focal objective of the government. Measuring immunization coverage in household surveys is not that simple. Parents often do not have the children's immunization/ health cards with complete information on vaccinations received.

TABLE 17

Percentage of Children Aged 12 to 23 Months who have been fully Immunized, by Income Groups and Region in the Punjab, 2001-02

Income Group	Urban Areas			Rural Areas			Both Areas		
	Male	Female	Both	Male	Female	Both	Male	Female	Both
1st quintile	37	33	35	19	23	21	22	25	23
2nd quintile	45	53	50	23	25	24	26	31	28
3rd quintile	45	55	51	24	24	24	29	33	31
4th quintile	53	55	54	32	33	32	38	40	39
5th quintile	59	68	65	26	40	32	37	55	46

Source: Government of Pakistan, *Pakistan Integrated Household Survey* (2001-02)

TABLE 18

Percentage of Children Aged 12-23 Months that have been Immunized

Region and Province	Based on Recall and Record – Fully Immunized 2004-05		
	Male	Female	Both
Urban Areas	86	87	87
Punjab	89	89	89
Rural Areas	73	71	72
Punjab	82	80	81
Overall	78	77	77
Punjab	85	84	84

Based on recall: Children reported as having received at least one immunization expressed as a percentage of all children aged 12-23 months.

Based on record: Children who reported having received full immunization who also have an immunization card, expressed as a percentage of all children aged 12-23 months.

Source: *Pakistan Social and Living Standards Measurement Survey* (2004-05).

Immunization rates based solely on the information given on immunization cards ('record') may therefore underestimate the figures. However, there is the advantage of using written information recorded by health workers. The alternative is to ask parents about the history of their child's vaccinations and assess coverage rates employing this information ('recall'). This has the disadvantage that parents may not remember vaccinations administered. Neither measure is ideal and without flaws. Both are presented in Table 18. There is an increase in complete immunization rates both for rural and urban areas but in rural areas it is particularly significant going from about 32 percent in 2001-02 to 72 percent in 2004-05 as the above tables indicate.

Infant mortality is an important demographic indicator. In Pakistan, there has occurred a decline in this indicator overall. In Table 19 data is presented on a comparison of infant mortality rates in the country overall and Punjab. From the data it is apparent that the rate is higher in the Punjab when compared to the overall figures. A fairly high rate is evident for rural areas both overall and the Punjab. Over time however there is a declining trend in infant mortality rates.

TABLE 19

Infant Mortality in Punjab and Pakistan (Deaths per 1000 Live Births)

	1996-97			1998-99		
	Male	Female	Both	Male	Female	Both
Pakistan	101	108	105	93	85	89
Punjab	108	121	115	100	91	95
Urban Pakistan	82	85	83	7	68	73
Urban Punjab	84	93	89	78	61	70
Rural Pakistan	108	117	112	99	91	95
Rural Punjab	116	130	123	109	102	106

Source: Government of Pakistan, *Pakistan Integrated Household Survey* (1998-99).

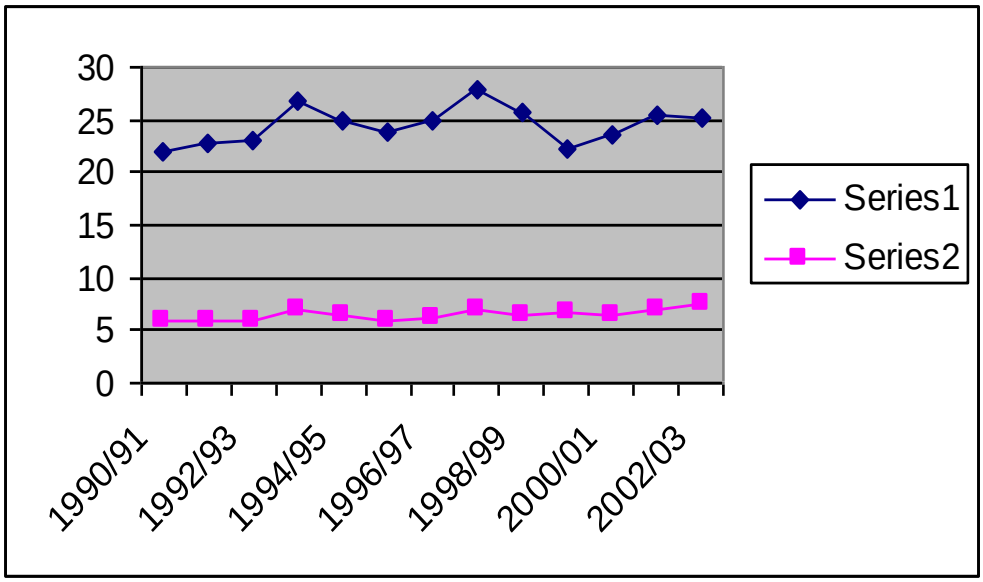
The prevalence of malnutrition has shown no signs of improvement since the last 20 years. The estimated number of malnourished children was around 8 million in 1997-98. Almost half the children under 5 years of age were underweight. The World Bank (2002) surveyed households in four districts of rural Pakistan and observed a total lack of improvement in these districts since an earlier study done 10 years earlier. For that matter they found a higher incidence of malnutrition. There are of course significant

variations across provinces, Punjab being somewhat better off than other provinces.

Both health and education indicators have themselves partially explain the reason that the province's economic growth rate was not sustained through the 1990s. While various household characteristics such as education, social attitudes, and cultural mores have an impact on determining health outcomes, the availability and quality of facilities appear to be the crucial element. There are serious shortcomings in the quality of services provided by public facilities, especially in rural areas such as the Rural Health Centers and Basic Health Units. As in education, the province's poor health indicators can also in the main be explained by low quality facilities and low spending on this sector. Let us next look at expenditures on health.

FIGURE 3

Share of Social Sector Expenditures in Total Expenditures



Series 1 represents share of education in total expenditure.

Series 2 represents share of health in total expenditure

Expenditure on Health

Table 20 shows the percentage share of health expenditure in total expenditure. The share has only nominally increased since 1990-91. The

expenditure was at its highest in 2002-03. Punjab's health expenditure of about 0.7% of provincial GDP is low by international standards since the average expenditure for all low and middle income countries is around 2% of GDP. Since non-salary inputs are insufficient, the government health facilities often run short of medicines and other supplies. This includes essential drugs.

TABLE 20

Percentage Share of Expenditure on Health in Total Expenditure

		Percentage Share in Total Expenditure				
	Health	General Hospitals and Clinics	Mother and Child	Other facilities and Preventive Measures	Others	Growth Rate in Expenditure on health
1990/91	5.82	5.01	0.04	0.02	0.74	
1991/92	5.95	5.06	0.03	0.02	0.84	13.65
1992/93	6.00	5.15	0.03	0.02	0.80	9.44
1993/94	6.91	5.84	0.03	0.02	1.02	14.31
1994/95	6.45	5.38	0.03	0.03	1.02	21.69
1995/96	5.79	4.93	0.05	0.04	0.77	5.59
1996/97	6.03	5.20	0.03	0.02	0.79	0.63
1997/98	6.86	5.77	0.03	0.03	1.03	20.75
1998/99	6.54	5.59	0.03	0.02	0.89	2.75
1999/00	6.78	5.37	0.02	0.02	1.36	23.38
2000/01	6.39	5.66	0.03	0.03	0.67	–5.23
2001/02	6.95	6.00	0.03	0.05	0.87	8.76
2002/03	7.45	6.51	0.04	0.04	0.86	7.19

Source: Government of Pakistan, *Pakistan Integrated Household Survey*, 2001/02.

Punjab's health expenditure of approximately 0.5% of provincial GDP is like education low by international standards – the average expenditure for all low and middle-income countries is roughly 2% of GDP. At about a third of total expenditures, allocations for non-salary inputs are insufficient, with the result that government health facilities routinely run out of medicine and

other supplies. For instance, in the last quarter of 1999, half of the primary health care facilities in the province reported that supplies of three essential drugs had been completely exhausted.

VI. CONCLUSIONS

Thus, we see that in the Punjab and elsewhere, social gaps and fissures are becoming ever worse. Given that, as stated earlier, aggregate social sector spending has been inadequate in the Punjab and Pakistan as a whole, it is particularly important to improve the impact of such spending on the poor. For one, expanding the share of primary education in educational expenditures is a way to ensure such an impact.

As the case of the Punjab shows, poor management and implementation have exacerbated the ill effects of scarce allocations for social programs. The province and the entire country exhibit constant problems in several dimensions of governance that are of relevance for healthy public spending: leakage, licit and illicit; difficulties with bureaucratic structure and quality; weaknesses in the rule of law, and opacity in government decision making (World Bank, 2002). Problems of implementation also crop up due to lack of management capacity in the public sector. To a certain extent, political factors also impede the implementation of public sector policies. For example, public expenditure allocations, such as the selection of infrastructure projects lacking sufficient attention to maintenance and sustainability, may be driven by incentives that govern local political dynamics. This phenomenon is particularly applicable to the Punjab. Again in the Punjab as elsewhere, there exists the elite capture of the state. The elites, barely benefiting from public spending focused on the poor, and in certain cases even threatened by it (education), are known to have blocked reforms.

By way of remedying the situation, social spending is embedded in the very fabric of government and society, so successful governance reforms will simply have to be comprehensive and broad in scope. Reforms that curtail waste and leakage in all areas of fiscal policy, particularly in development, and that deepen the rule of law have direct impacts on the efficiency of spending, which in turn relaxes the fiscal constraint that worsens the social gap.

Social sector reforms that overlook the difficulties that the poor encounter in holding the government accountable, and the vital role that local elites play concerning this, are highly unlikely to be successful. The lack of accountability can be improved by increased democratization, decentraliza-

tion, and transparency. All told, it is critical to ensure that growth is pro-poor and participatory, and the obstacles arising from resistance from local elites overcome.

It can be concluded from this analysis that government investments in education and skills enhancement, health and in the provision of infra-structure can have a direct effect on moving households out of poverty. The government should therefore continue to enhance its investments in these areas.

Pakistan is poised at an extremely critical moment in time when the right choices, priorities and strategies in education can enable it to progress on a sustainable and just trajectory of development. It is necessary, therefore to accelerate greater access to quality education at all tiers and across all regions.

As with the education system, the health system in the Punjab faces issues of equity, effectiveness and efficiency. The resources devoted to the health system are unequally distributed and not in proportion to the distribution of health problems. There is no substantial and growing evidence that considerable improvements in the health of the populace can be achieved at reasonable cost.

Another equally important set of factors the government should focus on relate to the strengthening of existing safety nets for the poor in the form of micro-interventions and welfare programs, which either supplement the assets of the poor or are given in the form of direct income and consumption support for the poorest.

And unless a concerted effort is made to better the social indicators in the Punjab, all the banter about high growth rates will prove meaningless. If the province and the country as a whole do not close its social gap, its long term ability to grow and alleviate poverty will be seriously at stake. Although a tall order, it is imperative for the problem to be tackled on a war footing.

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SOCIAL WELFARE MEASUREMENT IN PAKISTAN
An Ordinal and Cardinal Approach

MAZHAR UL HAQ BALUCH and SHAMA RAZI*

Abstract. Pakistan concentrated all development efforts aiming at tracking the economy on a higher and sustainable economic growth reducing unemployment, but these efforts resulted in high fluctuations in population falling under poverty line overtime. This indicated that not only the growth but also income distribution pattern associated with other socio and demographic factors constitute phenomenon to achieve the objectives having concern with welfare of the poor and non-poor. The present study addressed the measurement of social welfare of the country using the Ordinal and the Cardinal Approach on the basis of efficiency (economic growth) and inequality (income distribution pattern). The Lorenz curve closet to egalitarian line was of 2001-02, which reflected the highest social welfare gaining in this year. There emerged a merged line of the curves for 1990-91 and 1998-99. However this comparison gave ambiguous results due to intersection pattern. Gini-coefficients showed instability and remained fluctuating in the country as well as in rural and urban areas during the considered years. In 2001-02 a drastic decline to the extent of 0.29 in Gini-coefficient in Pakistan and the lowest one (0.16) in the history of the country in rural area was registered. There occurred always positive changes in social welfare due to increase in mean income, while inequality pattern contributed negative or nil during the considered period except 1998-2001. For this period the income growth and decrease in income inequality contributed positively in welfare of the population. By ignoring inequality and adjusting efficiency with the variable values of *B*, it was found that neglecting the effect of growth would not be beneficial for the society. In 2001-02 the highest changes in social welfare was estimated at considered values of *B* as the inequality declined during this period. Consequently efficiency and equality were both essential ingredients to increase welfare of population. Neglecting any might cause failure in consideration of welfare-oriented policy objectives.

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I. INTRODUCTION

The most serious challenge confronting the world today is widespread poverty. It is an inescapable fact that almost 20 percent of humanity or 1.20 billion people subsist on less than $ 1.0 a day. The gap between the rich and the poor has widened over the years as 80 percent of global GDP of $ 30 trillion accrues to only 20 percent of the world population (living in OECD countries) and the remaining 80.0 percent of the people have only 20.0 percent share of the world income. The average income in the richest 20 countries is 37 times the average of the poorest countries. According to the definition developed over time poverty is a complex and multi dimensional phenomenon, which goes beyond the notion of income and encompasses social economic and political deprivations.

Pakistan like other developing countries of the world is dependent on agrarian economy. Due to low productivity and alarming increase in population, per capita income is low and it has been ranked at 107 out of 134 countries (*World Development Report*, 2005). The country after 58 years of its life was still facing the problems of weak socio-infrastructure. Even now most of the indicators belonging to well-being such as literacy, education, health, nutrition, safe drinking water and sanitation, access to family services are comparatively low relative to other countries with same level of per capita income. As far as economic environment is concerned, it is truly complicated to measure economic performance of Pakistan, since various dimensional approaches accepted at global level in this context had not proved viable to give the expected results. During the overall period of 1960 to 1990 Pakistan would be placed in the top ten countries of the world. This made an eminent economist Professor Richard Eckaus remark, "Pakistan is a puzzle," a miracle of levitation. With one of the lowest domestic saving rate in Asia, its economy has performed quite creditably (Amjad, 2003). In such unexpected environment there emerge complexities with respect to development process specifically to determine priorities for concerned sector as well as economic indicators to achieve the stipulated objectives. Consequently, all efforts having concerned with development activities adopted in successive Five Year Plans proved abortive leading towards instability of economic growth of the country.

Kuznets (1963) identified that though relatively higher income disparity was regarded as the characteristics phenomenon of the less developed countries, yet in general the more rapid the growth during early stages, the more intense the development of income inequality. Underlying reasons for development of such situation were as follows:

- The development conscious government of the less developed countries, in order to raise investment, allow income disparities to widen.
- The resource mobilization policies often lag behind and fail to cope with the continuing growth process and the resources tend to concentrate among resource owners.

Thus, income concentration increases with economic growth during early stage of development. This gave indication that aggregate income alone is not welfare measuring tool for a society but the income distribution pattern is regarded as an important factor in measuring its level of welfare. Contrary to that it is also argued that the overall income and its distribution may improve leaving the income of the poor and/or their distribution of income unaltered or even worsened (Chowdhury, 1982).

In 1990s Pakistan encountered a deep and protracted recession, since GDP growth declined from 6.1 percent during 1980s to 4.2 percent during 1990s. The growth of large scale manufacturing sector, which is considered employment opportunities generating activity, and equilibrating income distribution tool, declined from 8.2 percent during 1980s to 4.4 percent during 1990s. Debt servicing as a percentage of foreign exchange increased from 18 percent in1980s to about 40 percent in the year 2000. The proportion of population below poverty line, thus, increased from 18 percent in 1987 to 34 percent in 2003 causing income disparity among different segments of the population. Lack of access to basic needs and other social needs undermines the capability, limits ability of population to secure gainful employment and results in income poverty and social exclusions.

Pakistan concentrated all development efforts aiming at tracking the economy on a higher and sustainable economic growth, reducing unemployment, raising the level of standard of living of the low income group but these efforts resulted in high fluctuations in population falling under poverty line overtime. This indicated that not only the GDP growth, but also other factors like income distribution pattern associated with other socio and demographic factors constitute phenomenon to achieve the objectives having concern with welfare of the poor and non-poor. Since all the social and demographic factors help enhancing efficiency or income growth and declining inequality in income distribution, the present study has been conducted to address the measurement of social welfare received by the population on the basis of mean income and income distribution pattern of the country considering the qualitative and quantitative approaches.

II. OBJECTIVES OF THE STUDY

The principal objectives of the study were as under:

- To estimate national output growth pattern overtime.
- To assess over time changes in income distribution pattern.
- To measure the social welfare and determine the status of changes in welfare with the passage of time.
- To propose policy measures for enhancement of welfare of the society in future.

To this end this paper is organized in the following fashion. The succeeding section, *i.e.* section III presents the methodology adopted to derive the stipulated results of the study. Results of the study based on the analysis made by applying the proposed methodology have been elaborately discussed in section IV. Whereas conclusions and policy implications are provided in the final section, *i.e.* section V.

III. METHODOLOGY

Methodology means strategic process leading towards the results required to derive from the available qualitative and quantitative information. It is developed keeping in view the nature and scope of the study. The ensuing study has been confined to measure welfare trend. Generally the welfare trend can be estimated by assessing income distribution. The vast gap in income and income holders would deprive of the lowest income segment of the society not only from basic needs but also make the social institutions out of the reach of such households. So the changes in welfare of Pakistan were estimated by using the methodology adopted by Mukhopadhaya (2003) to measure such changes in Singapur. However, the original references were coded to elaborate the methodology. The Ordinal Approach comprises Lorenz Dominance and Generalized Lorenz Dominance Approach, whereas Cardinal Approach was the measurement of social welfare using Sen-Social Welfare Function (Sen-SWF).

LORENZ DOMINANCE APPROACH

Bergson (1938) introduced the concept of Social Welfare Function (SWF) as a real valued function, defined on a set of alternative social states, whereas Samuelson (1949) investigated various ways for which SWF can be utilized in welfare economics. The most general form of SWF, as described by Bergson-Samuelson was as under:

$$W = w\,(U_1)\,(x_1),\ \ldots\ldots\ U_n\,(x_n)$$

Where

$U_i\,(x_i)$ = Utility obtained by the person i from income x_i. $i = 1$

However, the form varies from person to person.

Atkinson (1970) considered the ranking of social situations with the same mean income on the basis of additive separable SWF as:

$$W = \Sigma_{i=1}\ U_i\,(x_i)$$

Where

W = Welfare

$U_i\,(x_i)$ = Utility of person from income i

This form of the utility function might also vary from person to person. However he proved that imposing minimum restriction of concave utility function (assuming diminishing restriction of concave utility of income) it is possible to show that for a quite broad class of SWF, Lorenz ordering can rank alternative social condition. It is an intuitive measure of income inequality, which is the share of a certain percentile or deciles of a population in a sequence manner in total income. So Lorenz Curve is a devised diagram in which percentage of population are presented on the horizontal axis and percentage of income received by the respective group on the vertical axis. So a common way of describing income distribution is the Lorenz Curve, which is defined as the relationship between the cumulative proportion of the income units and the cumulative proportion of income received when units are arranged at ascending order of their income.

It has been formally presented as under:

$$LF_1\,(P) \geq LF_2\,(P) \geq LF_3\,(P)$$

While $0 \leq P \leq 1$

$$\Sigma U\,(u\,(x)\,F_1\,(x) \geq \Sigma U\,(u\,(x)\,F_2\,(x) \geq \Sigma U\,(u\,(x)\,F_3\,(x)\ \ldots$$

Thus

$$U'(x) > 0 \text{ and } U''(x) < 0$$

Where

$F_1(x)$ and $F_2(x)$ are two distribution with corresponding mass function $F_1(x)$ and $F_2(x)$ with the same mean income and $L\,(P)$ is the Lorenz Curve.

However, to make comparison among different periods, if the two Lorenz Curves cross each other, it is always possible to find out different concave utility function that can rank two social situations differently (Mukhopadhaya, 2003).

GENERALIZED LORENZ DOMINANCE APPROACH

It is observed that Lorenz Dominance as a criterion of welfare comparison gives only partial ordering of the income distribution. It permits comparison only when distributions have the same mean. Moreover, it ignores the economic efficiency/growth aspect of social welfare consideration. In the case of this study overtime welfare change was measured, while overtime change in income was definite. So Shorrock (1983) extended Atkinson's formulation by introducing the concept of Generalized Lorenz Dominance Approach. This approach was estimated by scaling the ordinary Lorenz curve up by the mean income. To scrutinize the trend of welfare Generalized Lorenz Procedure was used. However, Generalized Lorenz Curve was estimated applying the procedure given below:

$$U_1 LF_1(P) \geq U_2 L\, F_2(P), \text{ while } 0 \leq P \leq 1$$

For strictly concave utility function

$$\Sigma U(x)\, F_1(x) \geq \Sigma U(x)\, F_2(x)$$

Where

$F_1(x)$ and $F_2(x)$ = Two income distributions

U_1 and U_2 = Two means Income for $F_1(x)$ and $F_2(x)$.

SEN-SOCIAL WELFARE FUNCTION (SEN-SWF)

Since Lorenz Dominance and the Generalized Lorenz Dominance provide only partial ordering of the social welfare considering only inequality aspect, Sen-Social Welfare Function (Sen-SWF) was applied to judge the trend in total welfare and the trend in its component (equality and efficiency). So Sen-SWF a cardinal SWF has been applied to have quantitative/numerical values of all possible social situations. So estimation of Generalized Lorenz Curve was made by using the following formula:

$$\text{Sen-SWF} = 2 \int_0^1 UL(P)\, dP = U(1 - G)$$

Where

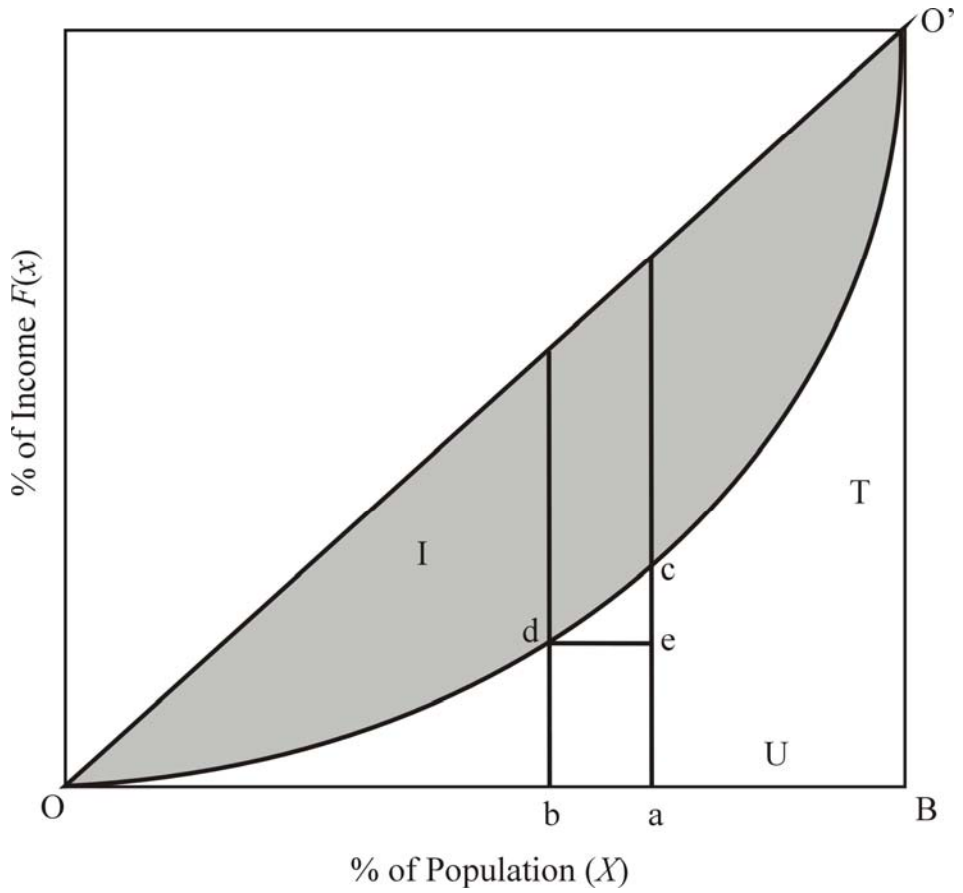
G = Gini Index, *i.e.* twice the area between the Lorenz curve and the 45 degree (egalitarian) line as is elaborated below:

GINI-COEFFICIENT

For a view of inequality with respect to all income groups, the cumulative distribution of income is usually plotted as the Lorenz curve and described by Gini-coefficient of concentration.

FIGURE 1

Cumulative Income Distribution



In Figure 1 the degree of inequality is represented by the size of shaded area *I*, representing the difference between the actual distribution of income described by the curve between *O* and *O*' and the line segment *OO*', relative to the area, *T*, defined by the right angle triangle *OBO*'. This ratio is the Gini-coefficient. Thus if incomes are distributed equally the area of I is zero and it is the index of inequality. If one person has all the income the index of

inequality is one. By calling U the complement of I in the right triangle T it would be:

$$G = \frac{1}{T} = \left(T - \frac{U}{T} \right) = 1 - \frac{U}{T}$$

For the population group denoted as *ab* in the figure and using the formulas for the area of a rectangle and a triangle:

$$U = (bd)\,(ab) + \frac{1}{2}\,(ce)\,(ab)$$

$$= (bd)\,(ab) + \frac{1}{2}\,(ac - bd)\,(ab)$$

$$= \frac{1}{2}\,(ab)\,(bd + ac)$$

In order to calculate an over all coefficient of inequality the sum of the area under the curve 'u' for all the population groups is needed. Since T can be written as:

$$\frac{1}{2}\ (i.e.\ \frac{1}{2} \times 1 \times 1)$$

So $G = 1 - \sum (ab)\,(bd + ac)$. So more generally:

$$G = \frac{\int_0^{100} [x - f(x)]\,dx}{\frac{1}{2}(100)^2}$$

Where

X = Cumulative percent Population

$F(x)$ = Cumulative percent Income

So

$(1 - G)$ = Twice the area below the Lorenz curve

Since the level of utility of a person may depend on his/her consumption bundle or income level, some disutility may be created due to inequity in the society as a whole. To capture this disutility due to inequality or any externalities in the society, the equity and efficiency will be assessed as under:

A common non-utilitarian form of Bergson-Samuelson SWF is as under:

$$NUBS = SWF = W(S, \varnothing)$$

Where

$NUBS$ = Nonutilitarian Bergson-Samuelson

W = Welfare

S = Total income representing efficiency

$\varnothing$ = Inequity

While

$$\varnothing = \phi(x_1, x_2 \ldots\ldots\ldots x_n)$$

The satisfying condition of estimated SWF was:

$$\frac{\partial w}{\partial s} > 0 \text{ and } \frac{\partial w}{\partial \phi} < 0$$

This would mean social welfare would increase with rising total income and would decrease with rising inequality. Obviously the set of admissible SWFs satisfying these conditions is enormous. In order to narrow down the set, Sen (1974) arrived at a specific form of the Bergson-Samuelson class of SWFs under certain restrictions, which was as follows:

$$W = U(1 - G)$$

Where the change overtime can be found out by having derivative of:

$$W = w(S, \varnothing)$$

So:

$$\frac{dW}{dt} = \frac{\partial W}{\partial S} \times \frac{dS}{dt} + \frac{\partial W}{\partial \varnothing} \times \frac{d\varnothing}{dt}$$

So the specific form indicating changes in social welfare was:

$$\frac{dw}{dt} = (1 - G)\frac{du}{dt} - U\frac{dG}{dt}$$

So for approximation of changes between two discrete points of time and to study changes in social welfare in terms of changes in equity and efficiency overtime, the equation considered was:

$$\Delta W \approx (1 - G)\,\Delta U - U\Delta G$$

Where

G = Gini-coefficient

$\Delta W = W_t - W_{t-1}$

$\Delta U = U_t - U_{t-1}$

$\Delta G = G_t - G_{t-1}$

To make overall determination of the welfare of a particular economic situation, various types of information was required. Information on inequality is one of the required indicators. For the Sen-SWF, the rate of substitution between inequality and efficiency at a constant welfare level could be captured by the elasticity between equality (that is 1 – Gini) and mean income.

$$\frac{dG}{1-G} \times \frac{U}{du} = 1$$

In addition an underlying assumption in the Sen-SWF was as under:

$$\frac{\partial w}{\partial x} > 0 \text{ for all } i$$

This means that any addition in income of anyone (i) must result in increase in social welfare of (i) other things remaining the same. This leads towards paretianity. However, the increase in welfare due to the increase in total income must be greater than the decrease in welfare due to increase in inequality. This means

$$\left(\frac{\partial w}{\partial s} \times \frac{\partial s}{\partial x_i}\right) dx_i + \left(\frac{\partial w}{\partial \varnothing} \times \frac{\partial \varnothing}{\partial w}\right) dx_i > 0$$

This principle deals with the efficiency aspect of SWF. The more generalized and flexible form of Sen-SWF is

$$W = U^B (1 - G),\ 0 \leq B \leq 1$$

If one wants to give more importance to efficiency than equity he will choose a high value of 'B', that is near one and on the contrary if equity will be preferred value of 'B' will be set below zero. Consequently with the knowledge of the existing level of inequality in the society by varying the value of 'B' the direction of a change in social welfare has been determined.

MARGINAL RATE OF SOCIAL WELFARE GROWTH

Marginal rate of social welfare growth has been estimated assuming unchanged inequality, which indicates that one percent increase in income would cause how much change in social welfare of population. This has been estimated by using the following formula:

$$MRS = [U_{t+1}(1-h) - U_t(1-h)] / \Delta U$$

Where

$$\Delta U = U_{t+1} - U_t$$

$$h = \frac{1}{2}(G_{t+1} + G_t)$$

IV. RESULTS OF THE STUDY

Initially certain information having deep concerned and may prove supportive instrument to provide comprehensive assessment for the study results was presented. Every economic concerning reform adopted overtime during the course of development of the country focused on acceleration of economic growth with specific concentration on increase in GDP and GNP pacing with population growth having concern with increase in per capita income on the average (growth in efficiency). The data reflecting over time growth rate of GNP has been presented in Table 1.

TABLE 1

Growth Performance of Gross National Product (GNP) for Selected Years

Years	GNP (Rs. in million)		Growth Rate (%)	
	Current Factor Cost	Constant Factor Cost	Current Factor Cost	Constant Factor Cost
1970-71	46006	152559	–	–
1979-80	210253	256358	16.4	5.3
1990-91	928406	453601	13.2	4.9
1998-99	2710396	620031	12.6	3.5
2001-02	3409083	691253	5.9	2.8

Source: *Pakistan Economic Survey*, various issues.

The data given in Table 1 reflected that gross national product (GNP) at current factor cost increased by 16 times in 2001-02 against 1979-80. The same increased by about 4 times in 2001-02, while comparison was made with the period 1990-91. The average annual growth rate at current as well as constant factor cost showed downward trend, so there emerged increase in annual average growth rate of GNP but at decreasing rate over time. At current factor cost it ranged from 5.9 percent to 16.4 percent, while in case of constant factor cost the average growth rate per annum of GNP remained ranging from 2.8 percent to 5.3 percent during the considered period.

REGIONAL GROWTH PERFORMANCE

Inner economic environment of country specifically with respect to investment pattern, product production and consumption is not only affected by the local political situation, economic conditions and social and cultural aspirations but also regional relations and economic and political stability at global level have direct or indirect bearings on country's economic growth. Certain natural occurrences also result in positive as well as negative impact on the economy at global level or certain parts of the globe, leaving no possibility for any country to be out of this hazard. However, to evaluate economic performance of a country three strategies can be used:

- Comparison of the economic growth of the current period with the economic performance of some normal year in the past.
- Assessment of potential and actual achievement with respect to economic performance of the country.
- Comparison of economic growth of the country with other countries having dealings in economic environment similar to the country concern.

Consequently the growth performance of the country has been compared not only with the developing countries, but also with the developed countries to determine its share in economic performance at global level. The data regarding the real GDP growth rate of select developed as well as developing countries have been presented in the Table 2 to assess regional growth performance. The results in the table show that the average annual growth rate of world GDP in real term was higher in developed as well as the selected developing countries in 1980-90 but it declined in 1990-2000 at global level. Even developed countries could not escape from it except that of Sri-Lanka and Malaysia. In 2000-01, improvement was observed in growth performance of GDP and that was again at global level. In Pakistan, the annual average growth rate of real GDP was lower (2.2 percent) in 2000-

01 relative to average annual growth rate of real GDP estimated in 1990-2000. The situation was not coinciding to global economic environment but this could be attributed to the effect of severe drought faced by the country concerned, which led the growth of agriculture, the main sector of the economy towards negative, *i.e.* (–)2.2 percent in 2000-01. Overall picture reflected fluctuations in growth performance of the developed as well as developing countries. However, the real GDP growth rate remained higher in Pakistan relative to overall World GDP growth rate during the whole considered period except 2000-01.

TABLE 2

Regional Growth Performance
(Real GDP Growth Rate of Selected Countries)

(Percent)

Country/Region	1980-90	1990-2000	2000-01	2001-02
World GDP	3.3	2.7	4.7	2.3
USA	3.5	3.4	4.1	1.2
Japan	4.1	1.3	2.2	–0.4
Germany	2.3	1.5	3	0.6
Developing Countries			5.7	4
Indonesia	6.1	3.8	4.8	3.3
Malaysia	5.3	6.5	8.3	0.4
India	5.7	5.9	5.4	4.3
Sri Lanka	4	5	6	0.4
Pakistan	6.3	3.7	2.2	3.6

Source: World Bank Outlook (IMF), April 2003.

PER CAPITA INCOME AND ITS GROWTH

Per capita income is generally accepted indicator to assess growth performance of a country. There is a need of higher growth rate in GDP relative to growth rate in population to enhance per capita income. The data presented in Table 3 indicate that there occurred increase by 14.2 percent on the average per annum in per capita income at current factor cost in 1979-80 over 1970-71, while such increase observed in 1990-91 declined to the extant

to 8.7 percent against 1979-80. In ultimate the average growth rate in per capita income in nominal term remained unstable during the considered period.

In real term the average growth rate of per capita income was 2.4 percent in 1979-80 over 1970-71 while it registered an increase at decreasing rate during the considered period and it decreased to 1.1 percent on the average per annum in 2001-02.

TABLE 3

Per Capita Income and its Growth Rate

Year	Per Capita Income (Rs.)		Average Growth Rate (%)	
	Current Factor Cost	Constant* Factor Cost	Current Factor Cost	Constant Factor Cost
1970-71	825	2762	–	–
1979-80	3103	3511	14.2	2.4
1990-91	8485	4146	8.7	1.4
1998-99	20377	4662	10.2	1.3
2001-02	23996	4866	4.2	1.1

Source: *Pakistan Economic Survey*, various issues.

*Base Year 1980-81

TRENDS IN INCOME INEQUALITY

The traditional concept of aggregate income or GNP growth was now not acceptable to assess the level of welfare of the society. Income distribution pattern among the members of the society has become an important factor in measuring populations' economic status. The data presented in Table 4 indicate that the share of the lowest 20 percent income group remained fluctuating ranging from 5.7 percent to 9.6 percent during the considered period. A relative better situation emerged in 2001-02, while the share of the lowest income group and middle income group in total income increased to 9.6 percent and 48.7 percent respectively, while the share of income group with the highest 20 percent decreased to 41.7 percent against 49.3 percent in 1990-91. In 1990-91, the share of the lowest 20 percent income group remained the lowest one (5.7 percent) widening the income distribution gap. Thus the share of the lowest income group remained on decline in general except 2001-02. An improvement was observed in income distribution

pattern in 2001-02 with increase in the income share of the lowest 20 percent as well as middle 60.0 percent income group, while this shift resulted the reduction to the extent to 41.7 percent in such share of the highest 20 percent income group. The ratio of the highest 20 percent to the lowest 20 percent was the lowest (4.3 percent) in 2001-02, indicating relatively better share of lowest income group.

TABLE 4

Income Inequality in Pakistan

Year	Percentage Share of Income			Ratio of Highest 20% to Lowest 20%
	Lowest 20%	Middle 60%	Highest 20%	
1970-1971	8.4	50.1	41.5	4.9
1979-1980	7.4	47.6	45	6.1
1990-1991	5.7	45	49.3	8.6
1998-1999	6.2	44.1	49.7	8
2001-2002	9.6	48.7	41.7	4.3

TRENDS IN INCOME INEQUALITY BY LOCATIONS

Pakistan population can be classified as rural and urban on the basis of location. Income distribution in rural area mainly depends upon the farm land distribution and cultivation right, which is the main source of income of rural population. The data given in Table 5 reveal that the share of 20 percent lowest income group remained higher in rural area throughout the considered period than that of urban area while the income share of the highest 20 percent income group was higher in urban area relative to rural area. This reflected relatively more income inequality in urban area than the rural area. However in 2001-02 the share of income of both groups indicated improvement in income distribution pattern to the best level in rural area while in urban area the situation emerged was quite worsened during the same period with ratio of the highest 20 percent to the lowest 20 percent estimated at 2.3 and 12.4 in rural and urban area respectively. However in the remaining period as well such ratio was relatively better in rural area as compared with urban area. In brief, it could be concluded that income distribution pattern was relatively better in rural area.

TABLE 5

Household Income Distribution by Locations for Selected Years

Years	Rural Area			Urban Area		
	Lowest 20%	Highest 20%	Ratio of Highest to Lowest	Lowest 20%	Highest 20%	Ratio of Highest to Lowest
1970-1971	NA	NA		NA	NA	
1979-1980	8.3	41.3	5	6.9	48	7
1990-1991	6	47.4	7.9	5.7	50.5	8.9
1998-1999	6.9	46.8	6.8	6	50	8.3
2001-2002	13	29.6	2.3	4.8	59.5	12.4

*On the basis of FBS, HIES data available for selected years.

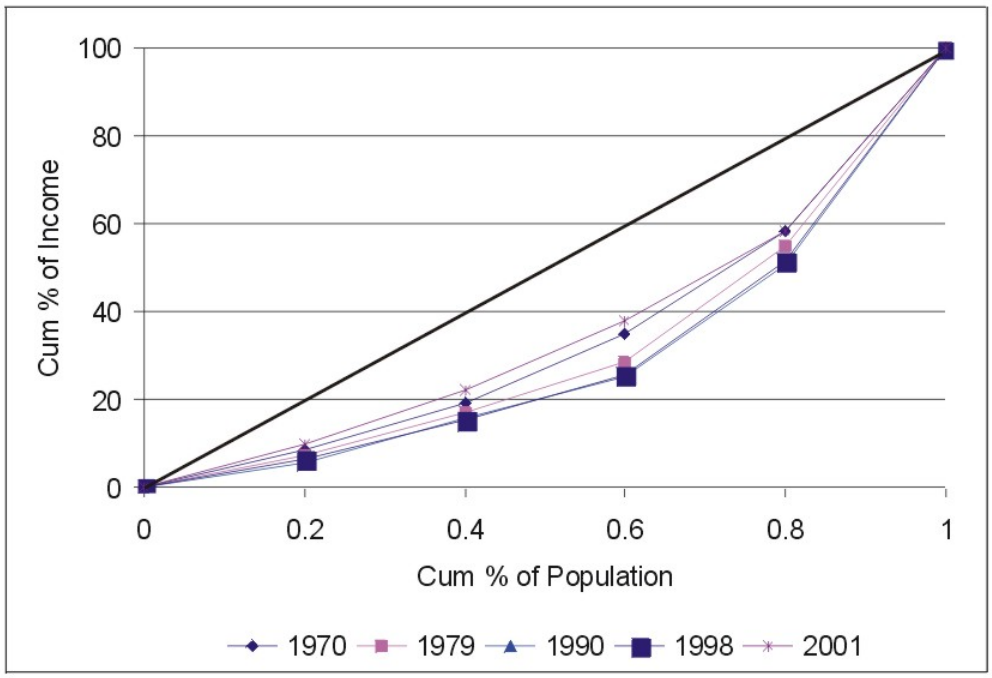
*NA = Not Available

THE LORENZ DOMINANCE APPROACH

A common way of assessing income distribution is the Lorenz curve, which is defined as the relationship between the cumulative proportion of the population and cumulative proportion of the income received by those population proportion units, while these units are arranged in ascending order of their income. The Lorenz Dominance Approach was applied to the data at the country level. The data transformed in Figure 2 indicate that the Lorenz curve closet one to the egalitarian line was of 2001-02, while all other curves remained below it. In this year the lowest 20 percent population segment received the highest share from income for this income group. Moreover it became one line matching with the curve of 1979 in case of the highest 20 percent income group because of no change in income distribution pattern in this segment of population in this particular year. For the period 1990-91 and 1998-99 the merged lines of curves showed similarity in social gaining pattern. In brief it could be concluded that social welfare received by the society was the highest in 2001-02. But this comparison leads towards ambiguous results on Lorenz curve intersection pattern basis.

FIGURE 2

Lorenz Dominance Approach



GINI CONCENTRATION RATIO

Concentration ratio is an intuitive measure of inequality and is especially useful to determine the degree of income disparity. If incomes are distributed equally, the Gini-coefficient will be zero, and beyond zero it lead towards index of inequality. To assess income disparity the past experience of the country was also considered and the Gini-coefficients estimated during certain years on the basis of data availability in the required concern were presented in the Table 6. The data reveal that the income distribution pattern remained relatively better during 1970-71 and 1979-80. The Gini-coefficient of household income had been 0.32 and 0.37 in Pakistan, while it reached 0.41 in 1990-91 and than the situation regarding income distribution pattern continued similarity and in 1998-99, the Gini-coefficient was estimated at 0.41. However, it was abruptly declined to 0.29 in 2001-02.

Further analysis on the basis of rural and urban areas reflected that income distributed remained better in rural area relative to urban area up to 1980. The situation deteriorated in rural area but rather improved in urban

area in 1990-91 and 1998-99, since it was 0.40 in rural area and 0.33 in urban area in 1998-99.

The estimates regarding Gini-coefficients showed instability and remained fluctuating in the country as well as in rural and urban areas of the country during the considered period, but stagnation was observed in estimated Gini-coefficient in 1990and 1998 in Pakistan. The fluctuation in income disparity remained the feature of rural and urban areas as well during the same period. However in 2001-02 a drastic decline was observed in Gini-coefficient and it was 0.29 in Pakistan while the lowest one in the history of the country, *i.e.* 0.16 in rural area. This could be attributed to policy measures developed diverting the resources towards welfare of common man to reduce poverty and inverse situation found emerged in urban area and the income disparity was at increase with the highest Gini-coefficients estimated to the extent to 0.48 in the area. This could be the result of excessive migration of population from rural to urban areas, which proved existence of factors widening the gap between the rich and the poor by waving off the effects of development process.

TABLE 6

Gini-Coefficient on Income Basis for Various Selected Years

Year	Total	Rural	Urban
1970-1971	0.32	0.27	0.33
1979-1980	0.37	0.32	0.4
1990-1991	0.41	0.41	0.39
1998-1999	0.41	0.42	0.33
2001-2002	0.29	0.16	0.48

Source: Various issues of *Pakistan Economic Survey*.

GENERALIZED LORENZ DOMINANCE APPROACH (GLDA)

Since the study needs examining welfare changes of country overtime for which essentiality demands changes in mean income of households or per capita income distribution, in this section Generalized Lorenz Curves were constructed and presented for various selected years considering data limitations. To construct the points of GLDA, the per capita income in real terms was considered for various years and the same was presented in Table 7.

TABLE 7

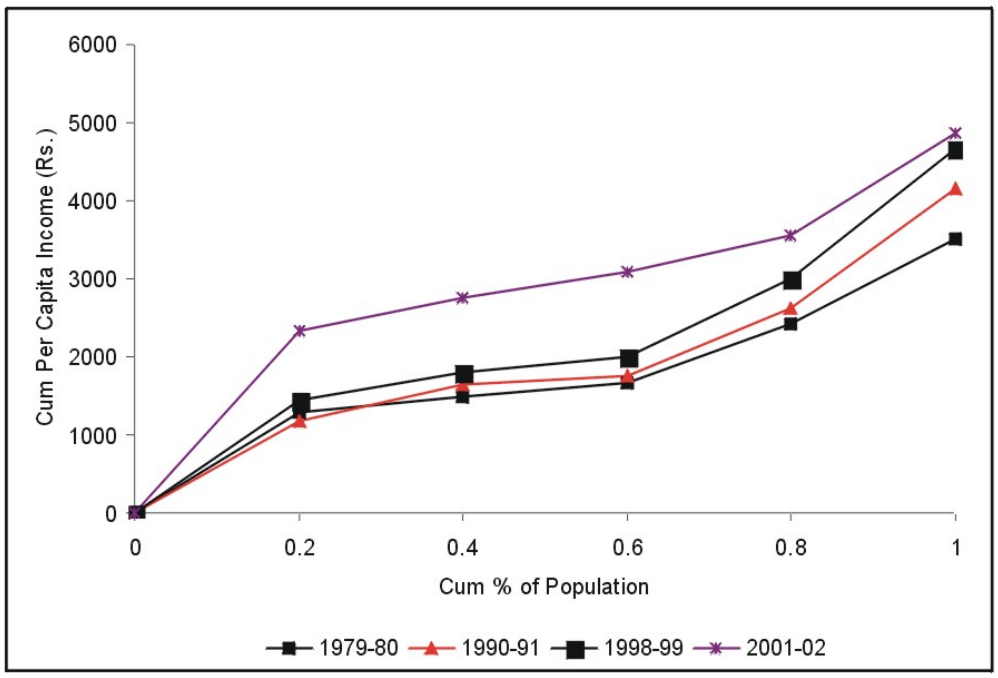
Points of Generalized Lorenz Curves on Quintile Basis

Population Proportion (%)	Cumulative Per Capita Income (Rs. Per Annum)			
	1979-80	1990-91	1998-99	2001-02
20	1299	1182	1445	2336
40	1492	1648	1795	2749
60	1673	1748	1997	3082
80	2413	2627	2990	3546
Overall	3511	4146	4662	4866

Source: *Pakistan Economic Survey*, various issues.

FIGURE 3

Generalized Lorenz Dominance Approach



According to the methodology the ranking of two income distributions with mean can have only an unambiguous welfare ranking if the Generalized Lorenz Curves do not intersect. Moreover, Shorrocks (1983) indicated that

even if ordinary Lorenz Curves of two distributions intersect, the condition of Generalized Lorenz Dominance may still be satisfied. The generalized Lorenz Curves of different years have been presented in Figure 3.

The data presented in this figure reflected that there emerged increase in Generalized Lorenz curves but with slow process. Points of Generalized Lorenz curve were estimated by using 1980-81 as the base year. The average per capita real income was Rs. 2,762 in 1970-71 which increased to Rs. 3,511 showing an addition in such income by 2.7 percent on the average per annum up to 1979-80. During overall considered period the average growth rate of per capita real income was 1.8 percent and it reached Rs.4866 in 2001-02. The Generalized Lorenz curve of 1990-91 intersects that of 1979-80 at the initial stage and then laid above the Generalized Lorenz Curve of 1979-80 indicating decrease in share of the lowest income group in social gaining. However the Generalized Lorenz curve of 2001-02 remained below such curve of 1990-91. This reflected that cumulative per capita income was higher in this year for all quintiles than 1990-91.

In brief this could be concluded that generalized Lorenz Dominance criterion gave partial ordering of social situation with one cross of the intersection of ordinary Lorenz curves.

SOCIAL WELFARE FUNCTION APPROACH

As is given in methodology Ordinary Lorenz Dominance and Generalized Lorenz provide partial ordering of the social welfare and for complete ordering Sen-SWF has been applied. So the estimates regarding SWF have been presented in Table 8.

The data presented in this table indicate that an increase of 1.7 percent was registered in real average per capita income per annum during the period from 1970-71 to 1998-99. There emerged increase in income inequality (quantified by Gini-coefficient) up to 1998-99, which overshadowed the increase in social welfare and it increased to the extent to 1.3 percent during the same period. However the inequality decreased to 0.29 in 2001-02 against 0.41 in 1990-91 and this increased the social welfare by 2.9 percent per annum from1990-91 to 2001-02, while increase in real per capita income during the same period was 1.3 percent. In 2001-02 the emerged situation registered more improvement with respect to gained social welfare, since an increase in social welfare was 5.9 percent on the average per year against an increase by 1.1 percent on the average per annum in real per capita income in 2001-02 relative to 1998-99. Consequently the results reflected that income distribution pattern has direct bearings on social welfare of the population.

TABLE 8

Social Welfare Gaining in Pakistan

Year	Average Income (Rs.)	Gini-coefficient	Social Welfare (Rs.)
1970-71	2762 (–)	0.32	1878.16 (–)
1979-80	3511 (2.4)	0.37	2211.93 (1.6)
1990-91	4146 (1.4)	0.41	2446.14 (0.8)
1998-99	4662 (1.3)	0.41	2750.58 (1.3)
2001-02	4866 (1.1)	0.29	3454.86 (5.9)

Figures in parentheses indicate average annual growth rate in percentage.

As far as the welfare measurement by location is concerned, there was found more income inequality in urban area with more mean income relative to rural area. Consequently, the income inequality effect to overshadow the welfare of income was relatively more in urban area, but the welfare estimated in urban area was relatively higher than rural area except 2001-02 due to vast difference in per capita mean income during the whole considered period. In 2001-02, though the per capita average income was less than the urban area of respective period, yet the income inequality reduced and the estimated Gini-coefficient was 0.16, which was accompanied by 5.9 percent average annual growth rate of per capita mean income. So increase in mean income and reduced income inequality resulted in an increase by 16.1 percent in welfare of rural area. This was the highest one in rural as well as in urban area during the considered period. This gave obvious implications that not only the increase in income but also income distribution pattern affects the welfare of the society of a country. The results regarding measurement of social welfare in Pakistan in urban and rural areas have been presented in Table 9.

TABLE 9

Welfare Measurement in Pakistan by Locations

Year	Urban Area			Rural Area		
	Average Income (Rs.)	Gini-Coefficient	Welfare (Rs.)	Average Income (Rs.)	Gini-Coefficient	Welfare (Rs.)
1970-71	3724 (–)	0.33	2495.08 (–)	2455 (–)	0.27	1792.15 (–)
1979-80	4581 (2.1)	0.4	2748.60 (1.0)	2845 (1.5)	0.32	1934.60 (0.8)
1990-91	4988 (0.7)	0.39	3042.68 (0.8)	3837 (2.5)	0.41	2263.83 (1.3)
1998-99	6444 (2.9)	0.33	4317.48 (3.9)	3902 (0.2)	0.42	2263.16 (0)
2001-02	6722 (1.1)	0.48	3495.44 (–5.1)	4903 (5.9)	0.16	4118.52 (16.1)

Source: Various Issues of Pakistan Economic Survey

Figures in parentheses indicate percentage growth per annum.

CHANGES IN WELFARE BY COMPONENTS

Welfare changes can be attributed to increase in income and distribution of income in a society. The estimates quantified in term of Gini-coefficients revealed that there were not many changes in income distribution pattern despite of development activities implemented over time to increase income spread to alleviate poverty. The data presented in the Table-10 show that there observed an upward change in mean per capita income during the considered period. The changes occurred in inequality of income distribution were quite nominal or no change in certain years. However an improvement was registered in income distribution pattern during 1998-99 to 2001-02 with downward change in estimated Gini-coefficient to the extent of 0.12 during this period. So the change in social welfare was the highest in this period relative to other considered period.

An increase in income affects overall welfare by two ways:

- It raises average income which generally has a positive effect on welfare.

- It alters income distribution pattern which has positive or negative effect depending on direction (positive or negative) of inequality.

So to decompose the changes in social welfare income and inequality in income distribution was taken into account and it was found that there existed positive correlation between income and welfare, whereas an inverse relationship was observed in welfare and income inequality. Generally the experience of income distribution pattern as was estimated by Gini-coefficient gave indication regarding negative contribution of it in social welfare of population in the country except the period 1998-99 to 2001-02. In 2001-02 with government's equity-enhancing policies the estimated Gini-coefficient declined to 0.29 the lowest one during the whole considered period, which resulted in addition of Rs.571.68 in social welfare change. (Table 10) In brief it could be concluded that increase in mean per capita income as well as the equality in income distribution both are essential to increase social welfare of the society in the country.

TABLE 10

Changes in Welfare by Components

Items	1970-71 to 1979-80	1979-80 to 1990-91	1990-91 to 1998-99	1998-99 to 2001-02
Change in Average Income (Rs.)	749	635	516	204
Inequality Change	(–)0.05	(–)0.04	Nil	0.12
Change in Social Welfare (Rs.)	333.77	234.21	304.44	704.28
• Due to Income: $(1 - G)\Delta u$ (Rs.)	490.595	387.35	304.44	132.60
• Due to Inequality: $u\Delta G$ (Rs.)	(–)156.825	(–)153.14	Nil	571.68

Change in average income in Pakistan registered increase with decreasing trend during the considered period while considering the rural and urban locations it was found that changes in mean per capita income remained fluctuating in both the areas in that period. Similar situation was observed with respect to income inequality which showed plus as well as minus changes in both the areas but such fluctuations were relatively more in urban area as compared with rural area due to availability of more employment opportunities and employment shifting to higher wage rate in

this area. In urban area negative change in social welfare was estimated during 1970-71 to 1979-80 and 1998-99 to 2001-02. In case of rural area an improvement was observed in income distribution pattern during 1998-99 to 2001-02 with positive change in income distribution leading the estimated Gini-coefficient downwards to the extent to 0.16 in this period. This increased the share of change in income inequality in total social welfare by 61.7 per cent in 2001-02. During the remaining period the income spread pattern contributed negatively in social welfare changes occurred due to changes in per capita mean income (Table 11).

TABLE 11

Change in Welfare by Location

Items	1970-71 to 1979-80	1979-80 to 1990-91	1990-91 to 1998-99	1998-99 to 2001-02
1. **Urban Area**				
Change in Average Income (Rs.)	857	407	1456	278
Change in Inequality	–0.07	0.01	0.06	–0.15
Change in Welfare (Rs.)	253.52	294.08	1274.8	–822.04
→ by change in Income	544.2	246.24	931.84	165.41
→ by change in Inequality	–290.68	47.84	342.96	–987.45
2. **Rural Area**				
Change in Average Income (Rs.)	390	992	65	1001
Change in Inequality	–0.05	–0.09	–0.01	0.26
Change in Welfare (Rs.)	142.45	329.23	–0.67	1855.36
→ by change in Income	274.95	629.92	38.02	710.71
→ by change in Inequality	–132.5	–300.69	–38.69	1144.65

SOCIAL WELFARE CHANGES BY VARYING JUDGMENT TOOLS

To make overall determination of the welfare of a particular economic situation various types of information are required. Lorenz ranking and Generalized Lorenz Dominance need information regarding mean income and income distribution pattern or inequality status. Though Lorenz Domi-

nance was an approach, used widely to rank social situations in a society, yet it gave incomplete ranking in this context. Similar problem of partial ranking has been identified in available literature by adopting Generalized Lorenz Dominance Approach. So Sen-Social Welfare Function (Sen-SFW) was applied to judge the trend in total welfare and the trend in its components (Inequality and Efficiency) Sen-SWF Approach was modified to make it more general and flexible with adjusting the mean income by variable values of 'β'. The value of 'β' would give more importance to efficiency than equity or vice versa, since the value of 'β' would indicate the effect of growth in the society. Thus changes in social welfare estimated by using different values of 'β' have been presented in Table 12.

TABLE 12

Social Welfare by Varying Judgment Tools

Year	$\beta = 0.00$	$\beta = 0.01$	$\beta = 0.05$	$\beta = 0.10$	$\beta = 0.50$	$\beta = 1.00$
1970-71	0.680	0.736	1.010	1.502	35.737	1878.16
1979-80	0.630	0.683	0.948	1.425	37.330	2211.93
1990-91	0.590	0.641	0.895	1.357	37.990	2446.14
1998-99	0.590	0.642	0.900	1.373	40.284	2750.58
2001-02	0.710	0.773	1.086	1.659	49.527	3454.86
			Changes in Social Welfare			
1970 to 1979	(–)0.05	(–)0.053	(–)0.062	(–)0.077	1.593	333.77
1979 to 1990	(–)0.04	(–)0.042	(–)0.053	(–)0.068	0.66	234.21
1990 to 1998	–	0.001	0.005	0.016	2.294	304.44
1998 to 2001	0.120	0.131	0.186	0.286	9.243	704.28

By considering social welfare only on the basis of equality $(1 - G)$ was too extreme, whereas using the value $\beta = 0.01$ reflected neglecting the growth in the society. The data in this table reveal that welfare remained fluctuating at all values of 'β' except $\beta = 0.5$, for which an increase over the years was observed. This led towards indication that neglecting the effect of growth would not be beneficial for the society, since an increase in mean

income not only increase the welfare but might also change Gini-coefficient depending upon the income distribution pattern and by this some segment of the society gets the fruit of this growth. However positive impact emerged over time by considering the value 'β' = 0.5. In 2001-02 the highest change in social welfare was registered at all considered values of 'β'. This indicated that efficiency as well as equality was essential ingredients to measure social welfare of society. Neglecting any might cause failure in consideration of welfare-oriented policy objectives.

The estimates regarding social welfare gaining by varying judgment tools by locations, *i.e.* rural and urban areas have been presented in Table 13.

TABLE 13

Social Welfare by Varying Judgment Tools by Locations

Year	β = 0.00	β = 0.01	β = 0.05	β = 0.10	β = 0.50	β = 1.00
Urban Area						
1970-71	0.670	0.727	1.011	1.525	40.886	2495.08
1979-80	0.600	0.653	0.914	1.394	40.610	2748.60
1990-91	0.610	0.664	0.934	1.429	43.082	3042.68
1998-99	0.670	0.731	1.039	1.611	53.784	4317.48
2001-02	0.520	0.568	0.808	1.255	42.634	3495.44
Rural Area						
1970-71	0.730	0.789	1.078	1.593	36.170	1792.15
1979-80	0.680	0.736	1.012	1.507	36.270	1934.60
1990-91	0.590	0.641	0.891	1.347	36.547	2263.83
1998-99	0.580	0.630	0.877	1.326	36.230	2263.16
2001-02	0.840	0.914	1.285	1.965	58.818	4118.52

The results given in the Table 14 regarding the changes in social welfare derived by changing the value of β reflected the similar situation in case of various locations such as urban and rural as it was in case of over all situations. By neglecting the growth in income the social welfare achieved was the lowest, *e.g.*, 0.520 from 0.670 during the considered period considering the value of β 0.00. Though welfare remained fluctuating on the basis of income distribution pattern every year, yet with increase in value of

β resulted in increase in such welfare of the society. The situation was observed in case of both in rural and urban areas. This gave indication that growth in income is the most essential ingredient to increase the social welfare. However the equity concept determined the sharing pattern of welfare among various segments of the society. If the changes in welfare are considered, there occurred increase in efficiency and decrease in inequality in rural area and this resulted in the highest growth rate in social welfare in 2001-02. In contrast to that in urban area there emerged a small positive increase in efficiency, but the sufficient increase in income inequality caused declined in social welfare in this area (Table 14). Consequently with the changes in value of indicating the efficiency pattern affected the welfare positively due to relatively better income distribution pattern during the same period in rural area, while in the urban area the efficiency was offset by the wide variations in income distribution pattern in this area. This again leads towards the situation that both the efficiency and the equality up to a relevant ratio would help in increasing the welfare in the concerned society.

TABLE 14

Changes in Welfare Overtime by Locations

Year	$\beta = 0.00$	$\beta = 0.01$	$\beta = 0.05$	$\beta = 0.10$	$\beta = 0.50$	$\beta = 1.00$
Urban Area						
1970-1979	(–)0.07	(–)0.074	(–)0.097	(–)0.131	(–).276	(–)253.52
1979-1990	0.010	0.011	0.20	0.035	2.472	294.08
1990-1998	0.06	0.067	0.104	0.182	10.702	1274.80
1998-2001	(–)0.150	(–)0.163	(–)0.231	(–)0.356	(–)11.15	(–)822.04
Rural Area						
1970-1979	(–)0.05	(–)0.053	(–)0.066	(–)0.086	0.100	142.45
1979-1990	(–)0.09	(–)0.095	(–)0.121	(–)0.160	0.277	329.23
1990-1998	(–)0.010	(–)0.011	(–)0.014	(–)0.021	(–)0.317	(–)0.67
1998-2001	0.26	0.284	0.408	0.639	22.818	1855.56

MARGINAL RATE OF GROWTH IN SOCIAL WELFARE

Marginal rate of growth in social welfare is the result of change in one percent change in income assuming unchanged equality. If there is an increase in the richest person's income, it will increase inequality as well as total income. In this case any type of situation might be for income

distribution, it has been assumed constant. The data presented in the Table 15 revealed overtime decrease in marginal rate of efficiency at all the values of β. The same situation emerged even considering the maximum value of $\beta = 1$. This indicated that the overtime growth in real income was not so as to yield the positive marginal rate of growth. However the changes in income inequality overtime resulted in positive contribution in attaining the increased welfare with the passage of time during the considered period.

TABLE 15

Marginal rate of Growth in term of Social Welfare
(Assuming Unchanged Inequality)

Year	$\beta = 0.00$	$\beta = 0.01$	$\beta = 0.05$	$\beta = 0.10$	$\beta = 0.5$	$\beta = 1.0$
1970 to 1979	0	2.274E-06	1.569E-05	4.690E-05	0.00586	0.655
1979 to 1990	0	1.734E-06	1.206E-05	3.643E-05	0.00493	0.610
1990 to 1998	0	1.459E-06	1.020E-05	3.103E-05	0.00445	0.590
1998 to 2001	0	1.485E-06	1.042E-05	3.183E-05	0.00471	0.650

TABLE 16

Marginal Rate of Growth in Term of Social Welfare by Locations
(Assuming Unchanged Inequality)

Year	$\beta = 0.00$	$\beta = 0.01$	$\beta = 0.05$	$\beta = 0.10$	$\beta = 0.50$	$\beta = 1.00$
Urban Area						
1970-1979	0	1.668E-06	1.164E-05	3.529E-05	0.00493	.635
1979-1990	0	1.377E-06	9.663E-06	2.952E-05	0.00437	.605
1990-1998	0	1.227E-06	8.672E-06	2.672E-05	0.00424	0.640
1998-2001	0	9.870E-07	7.015E-06	2.178E-05	0.00366	0.595
Rural Area						
1970-1979	–	2.288E-06	1.976E-05	5.890E-05	0.00685	0.705
1979-1990	–	2.076E-06	1.436E-05	4.306E-05	0.000551	0.705
1990-1998	–	1.642E-06	1.142E-05	3.454E-05	0.000470	0.585
1998-2001	–	1.761E-06	1.232E-05	3.746E-05	0.00536	0.710

In case of various locations the observed situation was similar to overall and marginal rate of growth in efficiency, considering income equality the

constant, caused decrease in marginal rate of efficiency growth overtime at all values of β even while β value was considered equal one except the period 1998-2001 in rural area for which the marginal rate of growth efficiency increased over the past period at all values of β. This could be attributed to increase in income's share of the lowest group and decrease in the share of the highest group bringing the ratio of the highest to the lowest to the extent to 2.3 percent the lowest one during the considered period. However this situation resulted in increase in growth efficiency to the extent to affect the marginal rate of growth of efficiency in this area.

V. CONCLUSION AND POLICY IMPLICATIONS

Pakistan concentrated all development efforts aiming at tracking the economy on a higher and sustainable economic growth, reducing unemployment, raising the level of standard of living of the low income group but these efforts resulted in high fluctuations in population falling under poverty line overtime. This indicated that that not only the GDP growth, but also income distribution pattern associated with other socio and demographic factors constitute phenomenon to achieve the objectives having concern with welfare of the poor and non-poor. Since all the associated social and demographic factors have direct or indirect bearings on income and income distribution pattern, the present study addressed the measurement of social welfare of the country using the Ordinal (Lorenz Dominance and Generalized Lorenz Dominance) Approach and Cardinal (Sen-SWF) Approach on the basis of efficiency (Economic growth) and inequality (income distribution pattern.

The Lorenz curve closet to egalitarian line was of 2001-02, which reflected the highest social welfare gaining in this year. All such curves of other considered years were out side of it. Moreover the lowest 20 percent population segment received the highest share from income for this income group in this year. It became one line matching with curve of 1979 in case of the highest 20 percent income group because of similarity in income distribution pattern in this segment of population. Again there emerged merged line of the curves for 1990-91 and 1998-99. However this comparison gave ambiguous results due to intersection pattern.

Gini-coefficients showed instability and remained fluctuating in the country as well as in rural and urban areas during the considered years. Disparity remained the feature of the rural and urban population through out the considered period. In 2001-02 a drastic decline to the extent to 0.29 in Gini-coefficient in Pakistan and the lowest one (0.16) in the history of the country in the rural area was registered.

Generalized Lorenz curve of 1990-91 intersects the curve of 1979-80 indicating decrease in share of the lowest income group in social gaining. Generalized Lorenz curve for the year 2001-02 remained inside of all the considered years which reflected that cumulative real per capita income was higher in this year for all quintiles.

An increase of 1.7 percent was registered in real per capita income per annum but increase in income inequality overshadowed the increase in social welfare and so it increased to 1.3 percent during the period 1970-71 to 1998-99. In 2001-02 the emerged situation reflected improvement with respect to gained social welfare, *i.e.* 5.9 percent against an increase by 1.1 percent on the average in real per capita income relative to 1998-99. The income inequality effect to overshadow the welfare of income was relatively more in urban area than the rural area, as the income inequality reduced to 0.16 and with the result increase in income was 5.9 percent while increase in social welfare was 16.1 percent.

There occurred always positive changes in social welfare due to economic growth or increase in mean income, while inequality pattern contributed negative or nil during the considered period except 1998-99 to 2001-02. For this period the income growth as well as the decrease in inequality contributed positively in social welfare. This reflected that not only the increase in income but also income distribution pattern affect the welfare of the population.

By ignoring inequality and giving weightage to efficiency by adjusting with the variable values of β, it was found that an increase in mean income not only increase the welfare but also change Gini-coefficient depending upon the income distribution pattern and by this some segment of the society gets the fruit of the growth. Thus neglecting the effect of growth would not be beneficial for the society. Moreover in 2001-02 the highest change in social welfare was estimated at all considered values of β, as the inequality declined during this period. Consequently efficiency and equality were both the essential ingredients to increase welfare of the population. Neglecting any might cause failure in consideration of welfare-oriented policy objectives.

POLICY IMPLICATIONS

The conclusion derived from the above discussion leads towards the options that GDP growth associated with relevant income distribution pattern need to be made the main focus of the Policy measures. There is thus a need to divert the resources towards the welfare of a common man to reduce income

disparity and raise the level of standard of living of the low income group. Proposed measures in this context are as follows:

- Provision of employment opportunities and reducing the discriminatory factors governing the public sector employment preferences.
- Reducing unemployment through establishment of technical and vocational training institutes in rural areas with specific self-employment orientations.
- Expansion of education and establishment of education network attractive for poor parents to won their preference to send the children to school.
- Development of other socio and demographic factors constituting phenomenon to achieve the development objectives having concern with welfare of the poor and non-poor.
- Development of market infrastructure suitable for enhancing productivity under labor intensive production technique specifically for locally consumed commodities.
- Adoption of other economically suitable associated measures to spread income flows.
- Evaluation of development measures implemented overtime for poverty alleviation by indifferent third party to assess their impact on welfare of the different segments of the population.

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STOCK RETURNS AND INFLATION: AN ARDL ECONOMETRIC INVESTIGATION UTILIZING PAKISTANI DATA

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Abstract. According to theory there establishes the relationship between stock market prices and inflation, this study investigates whether this holds for Pakistan, over the period 1971-2006. I examined the concerned relationship taking into account the existence of structural break over the considered time episode. The empirical practice utilizes ARDL, co-integration technique in said conjunction to detect the long run and short run affects between involves variable by Error Correction Approach (ECM). The results supports the hypothesis that stocks hedges against inflation in log run but not in short, while black economy promotes the stock market prices to heave both in long run as well as in short run.

I. INTRODUCTION

The inflation rate in Pakistan has moved from 9.25 to 12.9 percent from 1991 to 1995. The towering rates of monetary enlargement, low rate of economic growth in three out of the five years and adjustment in administered prices contributed to the relatively high rates of inflation. The expansion in money during 1994 was mainly on the account of accumulation of net assets than domestic credit creation. So, build up of foreign reserves had become necessary because of a draw down of reserves in the previous years. Thus the reason for the increase in money supply in 1994 was qualified very different. In 2004, inflation came down to 8.44 percent and again creeping up to 10.1 percent in December 2006, in the main time turn over on share prices have gone up from 45.82 $ USA (millions) in September (2003) to 190.81 $ USA (millions) in January (2005) only in Karachi Stock Exchange while market

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capitalization rose 36379.73 $ USA (millions) from 15194.45 in the same period. Finally, general price index also rose from 234.78 to 371.66 from September (2003) to January (2005) meaning that there is an upward trend in Karachi stock exchange.

Except for a turn down in September and October 2003, share prices continual their rising trend through most of the first ten months of fiscal year (FY) 2004, with the Karachi Stock Exchange (KSE)-100 index peaking at 5,621 on 19th April 2004. Subsequently, equity prices declined amid fluctuations, and the KSE-100 index fell to 5,297 on 30th June 2004. For the year as a whole, the index rose by 55.2 percent. Steady exchange rate, low interest rates, higher economic growth, improved corporate profitability, and improvement in relations with India were the key factors contributing to cheerfulness in the stock market in (fiscal year FY) 2004 (State Bank, 2005).

Theoretical and empirical research has shown that the monetary policy can significantly alter the course of real economic activity in the short-term, although in the long-term the impact of increase in excess money supply is only creation of inflation (Clarida *et al.*, 1999). As the objective of the monetary policy was achieved and growth had, in fact, overshot the target generating inflationary pressures the State Bank of Pakistan (SBP), the central bank, in July 2004 onwards had to shift the gear and moved more decisively to tackle inflation (Riazuddin, 2005). In order to contain inflationary pressures in the economy, SBP pursued tight monetary policy throughout FY (2006). However, instead of increasing the discount rate, State Bank of Pakistan (SBP), focused more on draining excess liquidity from the inter-bank money market. As a result, short-term interest rates remained close to the discount rate (State Bank, 2006).

Concluding, the Karachi Stock market followed upward and downward fluctuations from 1971 to 2006, with fluctuations especially in 2002 and 2006 under the shade of economic reforms.[1] The generalized Fisher hypothesis predicts that equity stocks, which represent claims against the real assets of business, may serve as a hedge against inflation.[2] Whether stocks

[1]Economic reforms in Pakistan started in 1991, a structural package by IMF.

[2]Stocks are said to provide a hedge against inflation if they compensate investors completely (and not by more) for increases in the general price level through corresponding increases in nominal stock returns, thereby leaving real returns unaffected. That is, stocks hedge against inflation if their real value or purchasing power is immune to changes in the general price level (Olesen Jan, 2006).

also provide a hedge against inflation empirically has been studied extensively in the literature, see, *e.g.*, Fama and Schwert (1977), Gultekin (1983), Boudoukh and Richardson (1993), Ely and Robinson (1997) and Barnes *et al.* (1999). With the only exception of Ely and Robinson (1997), cf. below, the literature has based its inference on return regressions where nominal stock returns are regressed on inflation and possibly further explanatory variables such as real production growth and changes in a relevant discount rate measure. The inflation hedge hypothesis is then put to a test by testing whether the coefficient to inflation is significant and equal to 1.[3] In such a case, investors would sell financial assets in the exchange for real assets when expected inflation is definite. Then, stock prices in nominal terms should fully effect the expected inflation and the relationship between these two variables should be positively correlated. While Bodie (1976) argued that equities are a hedge against inflation rate due to the fact that they represent a claim to real and, hence, the real change on the price of the equities should not be effected. In this situation, firms are able to predict their profit margins and since equalities are claims not on current but also on future earnings, which confirms that stock market operates as a hedge against inflation, at least in long run.

Literature supports the evidence that positive relationship between nominal stock returns and inflation over the long horizons. The relationship between nominal stocks returns and inflation in the United Kingdom is relative positive, a finding consistent with generalized Fisher hypothesis (Firth, 1979; Gultekin, 1983; Boudhouch and Richarson, 1993). Boudhouch and Richarson (1993) concluded that it is possible to recover a positive association between these two variables, however, the coefficient on inflation in long run horizons regression is 0.46, below the expected coefficient if the Fisher effect is held. Ioannidis *et al.* (2004) found evidence of positive

[3]Some studies frame the test in terms of real rather than nominal stock returns, testing whether inflation has a significant influence on real stock returns; *see*, for instance, Fama (1981) and Kaul (1987). A survey of the literature including a detailed account of the empirical results is provided by Frennberg and Hansson (1993). The latter study at the same time represents an exception in the literature as the authors conclude that Swedish stocks provide a hedge against inflation even at fairly short horizons (down to one month). Another survey of the literature can be found in Sellin (1998). He concludes, "Stocks seem to be a good hedge against both expected and unexpected inflation at longer horizons" (Sellin 1998, p. 25). However, this conclusion is based on an imperfect hedge definition, which allows stock prices (or returns) to respond more than proportionately to shocks to the general price level (or to inflation).

relation between inflation and stock market returns in Greece between 1985 and 2003. Kessal (1956) concludes that unexpected inflation increases the firm's equity value if the firm is net debtor.

The general conclusion is that stocks do not hedge against inflation in short run (investment horizons less than 1-2 years), where inflation usually turns out to have insignificant effect on stock returns. In fact, at short horizons the estimated relation between nominal stock returns and inflation may even be negative, see, *e.g.*, Fama and Schwert (1977) and Gultekin (1983). There is some evidence of a significant positive relationship on longer horizons (more than 2 years) but often with a coefficient different from 1 so that the inflation hedge is not perfect, cf. Boudoukh and Richardson (1993). Hence, the hedge hypothesis comes closer to receiving support at longer horizons but the evidence is still weak.

Literature also provides support for negative relationship between stock nominal returns and inflation in long run. Fama (1981) found that there is negative association between stock returns and inflation rate. The negative correlation exists due to the association between inflation and future output. Spyrou (2001) suggested that there exists a negative correlation between stock market returns and the level of inflation in Greece for the period 1990 to 1995. Some studies established mixed results about the relationship between stock market returns and inflation. Mark (2001), found the mixed empirical evidence on the concerned issue. Amidhud (1996) reported negative correlations between stock prices and inflation in short run which followed by positive association in the long period of time.

The main focus of this effort is on the relationship between inflation and stock market returns in short run as well as in long run. The basic question we attempt to give an appropriate answer through the analysis of the above relationship is whether the stock market has been a safe place for investors in Pakistan from 1971 to 2006 (June). This empirical analysis is investigated by means of an ARDL co-integration as well as short run causal coefficients. The remaining part of paper is organized as: section II presents model, methodology and data description, section III reports on empirical estimation, while section IV presents a brief summary with some concluding remarks.

II. MODEL, METHODOLOGY AND DATA

On the basis of theory of correlation between stock market returns and inflation, I developed the model for empirical investigation as given follows:

$$LSMI = \delta_0 + \delta_1 LSMI(-1) + \delta_2 LCPI + \delta_3 LBL + \mu_t \quad (1)$$

Where

LSMI = Log of stock market price index

LCPI = Log of consumer price index

LBL = Log of share of black economy (under-ground economy)

μ = Error term

The data of concerned variables has been obtained from *Monthly Statistical Bulletin* of State Bank of Pakistan and *Economic Survey of Pakistan* (Various issues).[4] In the time series realization is used to draw inference about the underlying stochastic process. So to draw inference from the time series analysis, stationarity tests become essential. A stationary test, which has been widely popular over the past several years, is unit root test. In this study Augmented Dickey Fuller (ADF) test applied to estimate the unit root. ADF test to check the stationarity series is based on the equation of the below given form:

$$\Delta y_t = \beta_1 + \beta_2 t + \delta\, y_{t-1} + \alpha_i \sum_{t=1}^{m} \Delta y_{t-1} + \varepsilon_t$$

Where ε_t is a pure white noise error term and

$\Delta y_{t-1} = (y_{t-1} - y_{t-2})$, $\Delta y_{t-2} = (y_{t-2} - y_{t-3})$ etc.

These test determine whether the estimates of δ are equal to zero. Fuller (1976) provided cumulative distribution of the ADF statistics, if the calculate-ratio (value) of the coefficient δ is less than τ critical value from Fuller table, then y is said to be stationary.[5]

ARDL APPROACH FOR INTEGRATION

Now, I employed the newly proposed autoregressive distributed lag (ARDL) approach for Co-integration (Pesaran and Shin, 1995, 1998; Pesaran *et al.*, 1996; Pesaran *et al.*, 2001). More recent studies have indicated that the ARDL approach to co-integration is preferable to other conventional co-integration approaches such as Engle and Granger (1987), and Gregory and Hansen (1996). One of the reasons for preferring the ARDL is that it is

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[4]Data of black economy has been taken from Social Policy and Development Center, Report No. 65, 2006.

[5]'t' ratio of coefficient δ is always with negative sings.

applicable irrespective of whether the underlying regressors are purely *I*(0), purely *I*(1) or mutually co-integrated. The statistic underlying this procedure is the familiar Wald or F-statistic in a generalized Dickey-Fuller type regression, which is used to test the significance of lagged levels of the variables under consideration in a conditional unrestricted equilibrium error correction model (ECM) (Pesaran, *et al.*, 2001). Another reason for using the ARDL approach is that it is more robust and performs better for small sample sizes (such as in this study) than other co-integration techniques.

The ARDL approach involves estimating the conditional error correction version of the ARDL model for variable under estimation. The Augmented ARDL ($p, q_1, q_2, \ldots\ldots q_k$) is given by the following equation (Pesaran and Pesaran, 1997; Pesaran and Shin, 2001):

$$\alpha(L,p)y_t = \alpha_\circ + \sum_{i=1}^{k}\beta_i(L,p)x_{it} + \lambda' w_t + \varepsilon_t \qquad (2)$$

$$\forall t = 1,.....,n$$

where

$$\alpha(L,p) = 1 - \alpha_1 L - \alpha_2 L^2 - ..... - \alpha_p L^p$$

$$\beta_i(L,q_i) = \beta_{i^\circ} + \beta_{i1}L + \beta_{i2}L^2 + ... + \beta_{iq_i}L^{q_i}\ \forall_i = 1,2...,k$$

y_t is an independent variable, α is the constant term, L is the lag operator such that $Ly_t = y_t - 1$, w_t is $s \times 1$ vector of deterministic variables such as intercept term, time trends, or exogenous variables with fixed lags.

The long-term elasticities are estimated by:

$$\phi_i = \frac{\hat{\beta}_i(1,\hat{q})}{\alpha(1,\hat{p})} = \frac{\hat{\beta}_{iD} + \hat{\beta}_{i1} + ... + \hat{\beta}_{i\hat{q}}}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - ... - \hat{\alpha}_p} \quad \forall i = 1,2,...,k \qquad (3)$$

Where $\hat{p}$ and $\hat{q}_i$, $i = 1, 2, \ldots, k$ are the selected (estimated) values of $\hat{p}$ and $\hat{q}_i$, $i = 1, 2, \ldots, k$.

The long run coefficients are estimated by:

$$\pi = \frac{\hat{\lambda}(\hat{p},\hat{q}_1,\hat{q}_2,...,\hat{q}_k)}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - ... - \hat{\alpha}_p} \qquad (4)$$

Where $\hat{\lambda}(\hat{p},\hat{q}_1,\hat{q}_2,....\hat{q}_k)$ denotes the OLS estimates of λ in the equation (2) for the selected ARDL model.

The error correction model (ECM) linked to the ARDL ($\hat{p},\hat{q}_1,\hat{q}_2,...\hat{q}_k$) can be obtained by writing equation (2) in terms of lagged levels and the first difference of y_t, x_{1t}, x_{2t}, …, x_{kt} and w_t:

$$\Delta y_t = \Delta\alpha_D - \alpha(1,\hat{p})EC_{t-1} + \sum_{i=1}^{k}\beta_{iD}\Delta x_{it} + \lambda'\Delta w_t - \sum_{j=1}^{\hat{p}-1}\alpha^{\bullet} j\Delta y_{t-1} - \sum_{i=1}^{k}\sum_{j=1}^{\hat{q}_{t-1}}\beta_{ij}\Delta x_{i,t-j} + \varepsilon_t \quad (5)$$

where ECM is the error correction model and it is defined as follows:

$$ECM_t = y_t - \alpha - \sum\hat{\beta}_i x_{it} - \lambda' w_t \quad (6)$$

x_t is the k-dimensional forcing variables which are not co-integrated among themselves. ε_t is a vector of stochastic error terms, with zero means and constant variance-covariance.

The existence of an error-correction term among a number of co-integrated variables implies that changes in dependant variable are a function of both the levels of disequilibrium in the co-integration relationship (represented by the ECM) and the changes in the other explanatory variables. This tells us that any deviation from the long run equilibrium will feed back on the changes in the dependant variable in order to force the movement towards the long run equilibrium (Masih and Masih, 2002).

The ARDL approach involves two steps for estimating long run relationship (Pesaran *et al.*, 2001). The first step is to investigate the existence of long run relationship among all variables in the equation under estimation. The ARDL method estimates $(p + 1)^k$ number of regressions in order to obtain optimal lag length for each variable, where p is the maximum number of lags to be used and k is the number of variables in the equation. The second step is estimate the long run and short run coefficients of the same equation. We run second step only if we find a long run relationship in the first step (Narayan *et al.*, 2004). This study uses a more general formula of ECM with unrestricted intercept and unrestricted trends (Pesaran *et al.*, 2001):

$$\Delta y_t = c_D + c_1 t + \pi_{yy} y_{t-1} + \pi_{yx.x} x_{t-1} + \sum_{i=1}^{p-1}\psi'_i\Delta z_{t-1} + w'\Delta X_t + \mu_t \quad (7)$$

where $c_0 \neq 0$ and $c_1 \neq 0$. The Wald test (F-statistics) for the null hypothesis $H_{\mathrm{D}}^{\pi_{yy}} : \pi_{yy} = 0, H_{\mathrm{D}}^{\pi_{yx.x}} : \pi_{yx.x} = 0'$, and alternative hypothesis $H_1^{\pi_{yy}} : \pi_{yy} \neq 0, H^{\pi_{yx.x}} : \pi_{yx.x} \neq 0'$. Hence the joint null hypothesis of the interest in above equation is given by: $H_{\mathrm{D}} = H_{\mathrm{D}}^{\pi_{yy}} \text{ 4 } H_{\mathrm{D}}^{\pi_{yx.x}}$, and alternative hypothesis is correspondingly stated as: $H_{\mathrm{D}} = H_1^{\pi_{yy}} \text{ 4 } H_1^{\pi_{yx.x}}$.

The asymptotic distributions of the F-statistics are non-standard under the null hypothesis of no co-integration relationship between the examined variables, irrespective of whether the variables are purely *I*(0) or *I*(1), or mutually co-integrated. Two sets of asymptotic critical values are provided by Pesaran and Pesaran (1997). The first set assumes that all variables are *I*(0) while the second set assumes that all variables are *I*(1). If the computed F-statistics is greater than the upper bound critical value, and then we reject the null hypothesis of no co-integration and conclude that there exists steady state equilibrium between the variables. If the computed F-statistics is less than the lower bound critical value, then we cannot reject the null of no co-integration. If the computed F-statistics falls within the lower and upper bound critical values, then the result is inconclusive; in this case, following Kremers *et al.* (1992) and Bannerjee *et al.* (1998), the error correction term will be a useful way of establishing co-integration. The second step is to estimate the long-run coefficient of the same equation and the associated ARDL error coercion models.

III. EMPIRICAL INTERPRETATIONS

Before I proceed with the ARDL bounds test, I tested for the stationarity status of all variables to determine their order of integration. This is to ensure that the variables are not *I*(2) stationary so as to avoid spurious results. According to Ouattara (2004) in the presence of *I*(2) variables the computed F-statistics provided by Pesaran *et al.* (2001) are not valid because bounds test is based on the assumption that the variables are *I*(0) or *I*(1). Therefore, the implementation of unit root tests in the ARDL procedure might still be necessary in order to ensure that none of the variable is integrated of order 2 or beyond.

I employed ADF dickey-fuller test to obtain the order of integration of each variable as results shown in Table 1, which indicates that two variables LSMI and LCPI are *I*(1), although LBL is integrated at *I*(0). The ambiguities in the order of integration of the variables lend support to the use of the ARDL bounds approach rather than one of the alternative co-integration tests.

TABLE 1

Unit-Root Estimation

Variables	Level ADF test statistics	Lags	1st Difference test statistics	Lags
LSMI	–2.522597	1	–4.063177**	1
LCPI	–6.468837*	1	–6.881162*	1
LBL	–2.251068	1	–3.320563***	4

NOTE: *, **, *** significant at 1 percent, 5 percent and 10 percent level of significance.

After finding integrating order of all variables, the two-step ARDL Co-integration (*see* Pesaran *et al.*, 2001) procedure is implemented in the estimation of equation (1) for Pakistan utilizing annual data over the period 1971-2006. In the first stage, the order of lag length on the first differenced estimating the conditional error correction version of the ARDL model for conditional equation is usually obtained from unrestricted vector autoregression (VAR) by means of Schwartz Bayesian Criteria and Akaike Information Criteria which is 2 based on the minimum value (AIC)[6] as shown in Table 2.

The results of the bounds testing approach for Co-integration show that the calculated *F-statistics* is 9.087[7] which are higher than the upper level of bounds critical value of 7.52 at the 1 percent level of significance, implying that the null hypothesis of no Co-integration cannot be accepted and there is indeed a Co-integration relationship among the variables in this model. Having found a long-run relationship, I applied the ARDL method to estimate the long run and the short run elasticities (*see* Pesaran *et al*., 2001 and Pesaran and Shin, 1999 for details). The total number of regressions estimated following the ARDL method in the conditional equation is $(2 + 1)^3 = 27$.

[6]I used AIC for lag length selection.

[7]As can be seen from Table 2, although the results of the *F-test* changes significantly at lag order 1, support for co-integration is less. *F-test* statistics is highly sensitive with the lag order; there is strong evidence for co-integration because our calculated *F-statistics* is greater than its critical value when second lag is imposed.

TABLE 2

Lag order	Akaike Information Criteria	Schwarz Criteria	Log Likelihood	F-Statistics for Co-integration
1	–4.223445	–3.690182	85.91028	4.873
2	–4.576818	–3.634066	98.80591	9.087*
Short run Diagnostic Tests Serial Correlation LM Test = 0.878750 (0.426846) W-Heteroscedisticity Test = 0.700509 (0.688057) Ramsey RESET Test = 0.138988 (0.713415) Jarque-Bera Test = 1.096(0.6238)				

NOTE: * representing the significant level at 1% level of significance while critical value is 7.52 respectively.

Long-run coefficients of the variables under investigation are shown in the Table 3. To test the impact of inflationary pressures on stock market prices, I regressed, the natural-log of the stock market price index on linear terms for the measure of inflationary pressures (consumer price index) and lag dependent variable because stock market prices are also affected by their previous trend.

TABLE 3

Estimated Long Run Coefficients Using the ARDL Approach

Dependent Variable: *LSMI*			
Variables	Coefficient	t-values	Prob-values
Constant	–0.242789	–0.356509	0.7239
LSMI (–1)	0.525613	3.644514	0.0010
LCPI	0.103085	1.761907	0.0879
LBL	0.669478	2.355411	0.0250
R^2 = 0.747351 Adjusted R^2 = 0.722901		Durbin-Watson stat = 1.5257 F-Stat (Prob-value) = 30.56 (0.000)	

Coefficient of inflationary pressures represents that stocks are hedges against inflationary pressures (inflation) in long run in the case of Pakistan and significant at 10 percent level of significance. While, previous trend of stock market is also having positive impact on the current stock market price significantly at 1 percent significant level. Finally, and surprisingly black economy promotes the stock market prices means more under ground economy (black economy), there will be a rising trend in stock market prices in long run significantly.

TABLE 4

Error Correction Representation for the Selected ARDL-Model (2, 1, 1)

Dependent variable: Δ*LSMI*			
Variables	Coefficient	t-values	Prob-values
Constant	–0.02937	–0.487251	0.6297
Δ*LSMI* (–1)	0.885764	2.686028	0.0118
Δ*LCPI*	0.283966	0.631094	0.5329
Δ*LBL*	1.064902	1.990976	0.0560
CR (–1)	–1.144181	–3.174132	0.0035
R^2 = 0.324380 Adjusted R^2 = 0.231192 Durbin-Watson stat = 2.012		Akaike info criterion = 0.023627 Schwarz criterion = 0.248092 F-statistic = 3.48 (0.02)	

After establishing the long run relationship between stock market prices and inflationary pressures in the case of Pakistan as discussed in Table 3. Table 4 gossips the short-run coefficient estimates obtained from the ECM version of ARDL model. The ECM coefficient shows the speed of adjustment of variables return to equilibrium and it should have a statistically significant coefficient with negative sign. The error correction term *CE*(–1), which measures the speed of adjustment to restore equilibrium in the dynamic model, appears with negative sign and is statistically significant at 5 percent level, ensuring that long run equilibrium can be attained. Bannerjee *et al.* (1998) holds that a highly significant error correction term is further proof of the existence of stable long run relationship. Indeed, he has argued that testing the significance of CE_{t-1}, which is supposed to carry a negative coefficient, is relatively more efficient way of establishing Co-integration.

The coefficient of *CE*(–1) is equal to (–1.14) for short run model respectively and imply that deviation from the long-term inequality is corrected by (114) percent over the each year. The lag length of short run model is selected on basis of Akaike Information Criteria (AIC).

Short run dynamics results also provide evidence that lagged stock market price is associated positively with current stock price at 1 percent level of significance. Inflationary pressure (consumer prices) is also having positive impact on stock market prices but not significant which, explains that, stock market returns are not hedge against inflation in short run because inflation usually turns out to have an insignificant effect on stock returns. Coefficient of black economy (underground or unregistered economy) also affects the stock market prices positively and significantly in short span of time.

Diagnostic tests for serial correlation, normality, heteroscedisticity and functional form are considered, and results are shown in Table 2. These tests show that short-run model passes through all diagnostic tests in the first stage. The results indicate that there is no evidence of Autocorrelation and that the model passes the test for normality, and proving that the error term is normally distributed. Functional form of model is well specified and there is no existence of white heteroscedisticity in model. The presence of hetero-scedisticity does not effect the estimates and time series in the equation are of mixed order of integration, *i.e.* *I*(0) and *I*(1), it is natural to detect heteroscedisticity (Shrestha, 2005). Finally, when analyzing the stability of the long-run coefficients together with the short run dynamics, the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMsq) are applied.

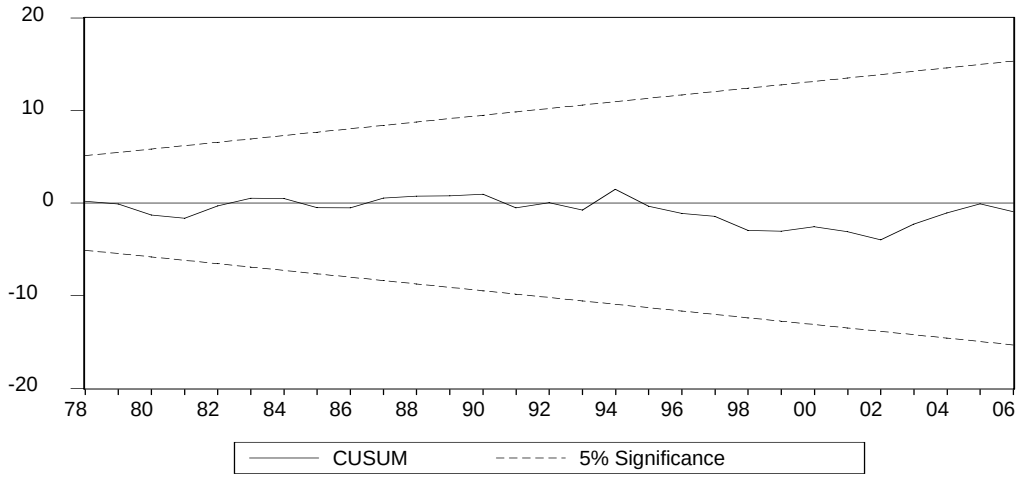
According to Pesaran and Shin (1999) the stability of the estimated coefficient of the error correction model should also be empirically investigated. A graphical representation of CUSUM and CUSUMsq is shown in Figures 1 and 2.

Following Bahmani-Oskooee (2004) the null hypothesis (*i.e.* that the regression equation is correctly specified) cannot be rejected if the plot of these statistics remains within the critical bounds of the 5% significance level. As it is clear from Figures 1 and 2, the plots of both the CUSUM and the CUSUMsq are with in the boundaries and hence these statistics confirm the stability of the long run coefficients of regressors that affect the stock returns in the country. The stability of selected ARDL model specification is evaluated using the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMsq) of the recursive residual test for the structural stability

(*see* Brown *et al.*, 1975). The model appears stable and correctly specified given that neither the CUSUM nor the CUSUMsq test statistics exceed the bounds of the 5 percent level of significance (*see* Figures 1 and 2).

FIGURE 1

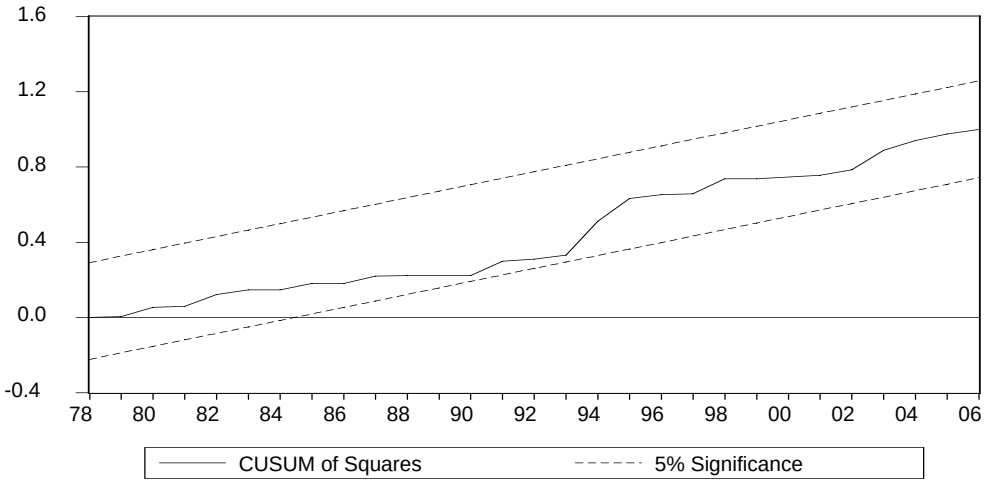
Plot of Cumulative Sum of Recursive Residuals



The straight lines represent critical bounds at 5% significance level.

FIGURE 2

Plot of Cumulative Sum of Squares of Recursive Residuals



The straight lines represent critical bounds at 5% significance level.

IV. CONCLUSIONS AND POLICY IMPLICATIONS

In this paper the impact of inflation and black economy on stock market prices was investigated in the case of Pakistan by employing the ARDL for long run and Error Correction Method (ECM) for short run dynamics. Results supports the hypotheses that stocks returns are hedges against inflation in long run but not in short run, while, under-ground economy (black economy) promotes the stock prices to get higher in long run as well as in short run. Application of CUSUM and CUSUMsq tests confirm the stability of long run estimates of sample period.

For policy implication, government should regularize the share of black economy through stock markets.

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RETURNS TO EDUCATION
The Case of Fertility

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Abstract. The purpose of this research is to observe the impact of the individual and aggregate-level education on the fertility rate in Pakistan. In this study, two specifications are used to quantify the impact of women's schooling on the aggregate fertility rate. In the first specification, the proportion of literate (formal schooling) married women is used irrespective of the level of educational attainments, while in the other specification, two alternative variables are used; first, the proportion of married women in a district, who have education below the secondary level, and second, those who have obtained secondary or higher education. The majority of the estimates are statistically significant and show the expected relationship with the fertility rate. The estimated coefficients of the macro fertility model establish a case for higher education for women to achieve a noticeable reduction in the fertility rate. Moreover, the impact of the general level of education of a district, after controlling for the level of economic development, appears an important element in the fertility response model.

I. INTRODUCTION

Since Malthus' time, population growth has been a key determinant in the analysis of poverty within a country and/or a region. One way to study the behavior of population growth is by understanding the determinants of fertility rates. The comprehension of these determinants could then be used for guidance in the formulation of socio-economic policies for effective poverty alleviation.

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Kravdal (2000) explained that although women's education has been one of the most thoroughly studied determinants of fertility, the research in this area is still far from being exhausted. For example, several causal links seem plausible in light of existing empirical evidence, but we have inadequate knowledge about their relative importance.

A review of the existing literature on fertility determinants shows a striking commonality in one aspect: most of the work done so far estimates the determinants of fertility using a micro-data approach. That is, the source of information is the household or, in several cases, the women. The explanation for this commonality is quite straightforward. Since the economic theories of fertility assume that parents have the number of children they do because in actual fact they desire approximately that number, given certain costs, it can be perfectly understood why studies use data on households to estimate fertility determinants.

Another important, and not so widely recognized challenge, is to find out whether education at the aggregate level has any effect on a woman's fertility above and beyond that of her own education. The possible importance of 'mass education' was discussed by Caldwell (1980) many years ago, and has been touched upon in a review by Cleland and Jejeebhoy (1996); however, little empirical evidence has so far been accumulated. Recently, Kravdal (2000) empirically searched for aggregate-level effects of education on fertility using data on Zimbabwe and found some evidence of the effects of district education on women's fertility.

Conceptually, in addition to the effects of women's education, there may be a 'spill-over' from other people's education through, for example, social learning. Uneducated women who live in societies where a large proportion are literate, or where the average educational level is high, may have a fertility different from that of uneducated women elsewhere. Also the better-educated may be influenced by the educational distribution in the community. If aggregate education has, on the whole, a substantial reducing effect, fertility will decline more sharply in response to an increase in women's education than as suggested by the estimates of individual-level effects.

So far, we have focused on variables that might reasonably be expected to influence fertility but not be influenced by it. Examples of variables which stand in a relation of mutual interdependence with fertility (or are jointly determined) are infant mortality and female labour force participation. There are good reasons for infant mortality to affect fertility. Parents may have more children than they ultimately desire in anticipation of losing some (so-

called 'hoarding' behavior). They may also replace lost children. At the same time, high fertility itself is likely to raise infant mortality, due to both biological and behavioural reasons.[1] Likewise, higher female labour force participation may both lead to and result from lower fertility.[2]

This research, therefore, quantifies the effects of education on fertility using aggregate data of Pakistan at the district level.[3] It includes both aggregate district education level and percentage education level of married women in a fertility model, along with other variables that are determinants of fertility.

The paper is organized as follows. Fertility behavior at the aggregate level is modeled in section II. This section also provides the definition of the variables used in this study and data sources. Results are presented in section III, while the last section provides the conclusions of the paper.

II. AGGREGATE FERTILITY MODEL AND DEFINITION OF VARIABLES

Economic theories of fertility assume that parents have the number of children they do because they desire approximately that number, given the costs of birth control. This demand for children, at a household level, is affected by many socio-economic factors such as the level of human capital of family members, family income and assets, and the experience of child mortality. By extension, fertility rates at aggregate level can be modeled as:

$$F = \alpha + \beta_i [SLE] + \gamma_i [MWE] + \delta_i [DC] + \kappa [IMR] + \lambda_i [PD] + \mu \qquad (1)$$

The dependent variable F denotes the fertility rate, which is taken here as the average number of children per married women (in the 15-45 age group) in a particular district. Aggregate-level effects of education on

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[1]High fertility is associated with short birth spacing, and with bearing children at relatively young or old ages, both of which increase the risk of infant mortality (*see* Wolpin, 1997, for a review of this literature). If high fertility is motivated by the desire for sons, it may go hand in hand with high mortality among unwanted girls. *See* Das Gupta (1987) for evidence of high mortality among higher birth-order girls in Punjab.

[2]The association between fertility and female labour force participation in India is discussed in Murthi *et al.* (1995).

[3]Census Commission of Pakistan does not issue the census data at micro level at Pakistan level. That is why, we use aggregate approach in this study to estimate our models.

fertility are represented by district School Life Expectancy (*SLE*).[4] The *SLEs,* described in detail later, are computed separately for males and females. *MWE* is a vector of educational attainments by married women and includes various levels of education. District characteristics are taken care of by *DC*, which is a matrix and is composed of three column vectors. First, Index of Economic Development (IED) is included to proxy the level of income and development of a district. Second, the health status of the district is incorporated, which is measured through first level health institutions (Rural Health Centre, Basic Health Unit, Sub-Health Centre, Mother Child Health Centre, Dispensaries, Reproductive Health Units and Mobile Health and Family Planning Units) per 1000 population.[5] It is hoped that these facilities would cause a decline in the fertility rate due to an increase in health and family planning consciousness. The third vector is the female labour force participation rate, which is also hypothesized to have an inverse relationship with the fertility rate. Infant Mortality Rate[6] (*IMR)* is measured by the number of children that died before turning one year old out of 1000 ever born alive. Micro-level studies on fertility behavior indicate a direct relationship between fertility and infant mortality and therefore, reflect the desire through replacement. *PD* is a vector of provincial dummy variables to capture the differences and dissimilarities in provinces regarding non-measurable environmental and locational aspects.

With the exception of the composite IED, all variables are constructed using Pakistan Population Census (1998) data. The computational detail of SLE and IED is provided in the following sub-sections, while the average values of the variables used in multivariate regression analysis are furnished in Table 1.

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[4]SLE is a flow variable and depicts the current enrollment situation in a district; therefore, it is preferred over adult literacy rate, which is a stock variable. In principle, it would be useful to distinguish between different levels of education, and to take into account the *quality* of education.

[5]The data for district health facilities is taken from Pakistan Health & Population Welfare Facilities Atlas, Planning and Development Division, Government of Pakistan (2000).

[6]As can be noted in equation (1), IMR is treated as an exogenous variable. One assumption could be that IMR is endogenously determined. This specification is also tested using Two-Stage-Least-Square technique. The results were not statistically sound, but the relationship between IMR and fertility were positive in both specifications.

TABLE 1

Variables Used in Macro Fertility Response Model [Average Level]

Variables	Overall	Provinces			
		Punjab	Sindh	NWFP	Balochistan
Fertility Rate	4.49	4.66	3.94	4.83	4.32
School Life Expectancy – Male (Years)	6.70	7.87	5.96	7.35	5.02
Literate Married Women (%)	14	23	13	10	6
Married Women – Below Secondary (%)	9	16	8	6	4
Married Women – Secondary or Higher (%)	4	6	5	4	2
Index of Economic Development (%)	32.67	38.05	38.69	26.84	27.32
Female Labour Force Participation (%)	2	2	3	1	2
District Health Status (Institutions per '000' population)	0.12	0.08	0.06	0.12	0.24
Infant Mortality Rate*	140	126	185	90	178
Number of Districts	100	34	16	24	26

*Generally in demographic surveys, IMR is computed on the basis of 3 year averages. In the Population Census, data is only available for one year. Therefore, these estimates seem overestimated and are thus indicative.

SCHOOL LIFE EXPECTANCY (SLE)

According to the World Education Report (UNESCO, 1995), the SLE is defined as "the number of year of schooling which the child can expect to receive in the future, assuming that the probability of his or her being enrolled in school at any particular future age is equal to the current enrollment ratio for that age." Taking the reference age-range to be 5-24, SLE for *ith* district may be expressed as:

$$SLE_i = \sum_{i=5}^{24} E_{ij}$$

where E_{ij} is the enrollment rate at age j in district i. Thus, SLE expresses in a compact form the enrollment position for the district over the 19-year schooling cycle. As Ram (1999) pointed out, the advantage of SLEs is that they are based on enrollment rates in the standard age-range for schooling, and the difficulty of combining enrollment rates for three conventional levels is avoided.

Student population in different age-cohorts is taken from the Population Census (1998). For this exercise, SLEs are computed separately for males, females and combined enrollments.

INDEX OF ECONOMIC DEVELOPMENT (IED)

The index is constructed along the lines proposed by Filmer and Pritchett (1999) through the use of the Principal Component Analysis (PCA) on the given below indicators. The PCA searches for the linear combinations of the variables selected that account for the maximum possible variance in the data. The exercise was undertaken on the full sample and factor scores of principal components were used to construct the index of economic development.

As National Accounts do not report Gross Domestic Product at the district level, the district's economic development is represented by a composite development index. Various attributes or indicators have been integrated to develop a composite Index of Economic Development.[7] These indicators measure the economic potential and achieved levels of income and wealth; extent of mechanization and modernization of agriculture; housing quality and access to basic residential services; and the development of transport and communication network. A brief description of individual indicators is given below.

[7]Diverse sources are used to gather data for the above indicators. Major sources include; District Census Reports (1998), Provincial Census Reports (1998), Agriculture Statistics of Pakistan (1998-99), Provincial Development Statistics, Crop Area Production (1997-98), Census of Manufacturing Industries (1995-96). Further, to fulfill the missing gaps or for updating various information, unpublished data is obtained from the provincial Bureaus of Statistics, State Bank of Pakistan and the Ministry of Agriculture.

Household income and wealth is the most discussed welfare attribute in literature. Direct income data at provincial or district levels is not available; therefore various proxies are used to estimate the income and wealth position of a district. For the rural economy, *cash value of agricultural produce per rural person* and *livestock per rural capita* are used. All major and minor crops are considered to estimate the district's cash value from agriculture. This indicator is based on the aggregation of 43 crops, including fruits and vegetables. Different types of livestock have been aggregated by assigning weights as recommended by the FAO (Pasha and Hassan, 1982) to reflect the capital value of various animals and poultry. For the urban part of a district, *per capita value added in large-scale manufacturing* is used to proxy the level of urban income. Value added by the small-scale component could not be included due to the lack of data. On the assumption that there may be a direct link between the number of bank branches in a district and the volume of bank deposits, *number of bank branches per capita* is used as a crude measure of the district's wealth. *Per capita car ownership* is also used to proxy the district's income and wealth in the urban areas. This variable is calculated on the bases of overall Pakistan (both rural and urban areas are included).

Modernization of agriculture is another area of development which has direct or indirect effects on the prosperity and standard of living of the rural population. To capture the process of mechanization in agriculture, *tractors per 1000 acres of cropped area* is used. *Consumption of fertilizer per 100 acres of cropped area* is also used as an indicator of modernization in agriculture. In addition, *irrigated area per 100 acres of cropped area* is used to capture the access to canal irrigation systems and tube-wells.

Shelter is one of the basic needs, and housing conditions are one of the key determinants of the quality of life. For IED, the *proportion of households using electricity, gas and inside piped water connections* is used. The quality of housing stock is represented by the *proportion of houses with cemented outer walls and RCC/RBC roofing*. *Rooms per persons* is used to proxy adequate housing in a district.

Three indicators have been included to portray the level of development of the transport and communication sector in a district. Roads and the transportation network have a significant impact on socialization and modernization. Therefore, *metalled road mileage per 100 square miles of geographical area* of a district is included in the index. With regard to the availability of transport vehicles, a summary measure, *passenger load carrying capacity,* is included. Different vehicles are aggregated assigning

weights as recommended in Pasha and Hassan (1982). *Number of telephone connections per 1000 persons* is also used to observe the distribution of this important indicator of the standard of living.[8]

III. RESULTS

Tables 2 and 3 provide Ordinary Least Square (OLS) estimates of the macro fertility model.[9] All regressions are statistically significant. Adjusted R^2 is 0.45, pointing at a good fit of the model. The majority of the estimates are statistically significant and show the expected relationship with the fertility rate. The proxy used to represent district health facilities[10] depicts an inverse relationship with the fertility rate, but is not statistically significant; this indicates low coverage, and less effective health and reproductive health facilities. Improvement in health facilities can produce better result to control fertility and infant mortality rate.

The followings sections provide some comments regarding the relationship between fertility and the core variables: economic development, aggregate-level education and individual-level education.

ECONOMIC CONDITIONS AND FERTILITY

The relationship between economic conditions and fertility, at best remains unclear. Once children can be regarded as a special type of commodity, in the economic parlance, a feasible relationship between income and fertility is not difficult to visualize. A rise in income is likely to be associated with higher fertility. The rationale behind this positive income-fertility

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[8]See detailed methodology, Jamal and Khan (2005).

[9]To econometrically evaluate the model specification, an important statistical test (White, 1980) is applied. Basically it consists of taking the residuals from the model to be tested, and regressing the squares of these residuals on the (unduplicated) squares and cross-products of the model regressors. Then, under the null hypothesis, test statistic (nR^2) is distributed as a chi-square with degree of freedom equal to the number of regressors in the test regression.

White's test for the joint null hypothesis of no-specification-error and homoskedasticity is not rejected at the 5 percent level for any regression. Therefore, the model used appears econometrically reasonable and theoretically close to what is feasible.

[10]Other health related variables such as per capita hospital bed availability, per capita availability of doctors, access to safe drinking water, proportion of children who have completed vaccination, are also tried in the macro fertility response model, but none of these appeared statistically significant.

relationship is that, holding everything else constant, higher income implies greater resources available to support a large family; in accordance, if children are assumed to be consumer durables with a positive income elasticity, higher income will lead to the consumption of more children (Becker, 1960). But the value or utility of children has not been invariant over time and space. With a rise in income, a greater concern for the quality of children rather than their quantity may become the dominant concern. And since quality children usually require greater investment than return, a rise in income might in fact lead to a reduction in fertility. Furthermore, a majority of the later studies tend to support this negative association.

TABLE 2

Regression Result [Version 1]
Dependent Variable: Total Fertility Rate

Variables	Coefficients	Std. Error	t-Statistic	Prob.
Index of Economic Development	–0.068	0.031	–2.23	0.03
Index of Economic Development ^2	0.002	0.001	2.66	0.01
Index of Economic Development ^3	–1.02E-05	4.25E-06	–2.40	0.02
School Life Expectancy – Male	0.106	0.036	2.90	0.01
Literate Married Women	–2.527	0.813	–3.11	0.00
Female Labour Force Participation	–5.807	3.931	–1.48	0.14
Infant Mortality Rate	0.001	0.001	1.76	0.08
District Health Status	–1.163	0.670	–1.74	0.09
Proportion of Urban Population	–0.011	0.005	–2.13	0.04
(Constant)	5.126	0.481	10.66	0.00
R-squared	0.57	F-statistic		9.44
Adjusted R-squared	0.51	D-W Statistics		1.99

NOTE: Prob. reflects the level of significance.

This empirical investigation suggests a cubic relationship between fertility and the level of economic development. At very low levels of development, an inverse relationship exists perhaps due to high costs of children. The positive relationship, at the medium level of development, between standard of living or economic development and fertility is evident from the estimated macro model. This suggests more demand for children as income rises. Quite understandably, the relationship is negative at the highest

level of development. The phenomenon supports the findings of fertility studies at the micro level.

TABLE 3

Regression Result [Version 2]
Dependent Variable: Total Fertility Rate

Variables	Coefficients	Std. Error	t-Statistic	Prob.
Index of Economic Development	–0.0563	0.0313	–1.80	0.08
Index of Economic Development ^2	0.0015	0.0007	2.11	0.04
Index of Economic Development ^3	–0.00001	0.0000047	–1.79	0.08
School Life Expectancy – Male	0.1142	0.0348	3.28	0.00
Married Women (Below Secondary)[11]	–2.9447	0.6950	–4.24	0.00
Married Women (Secondary or higher)	–7.9414	4.7273	–1.68	0.10
Female Labour Force Participation	0.0009	0.0005	1.86	0.07
Infant Mortality Rate	–0.8598	0.6794	–1.27	0.21
District Health Status	–0.0091	0.0047	–1.93	0.06
Proportion of Urban Population	–0.0563	0.0313	–1.80	0.08
(Constant)	5.1345	0.4811	10.67	0.00
R-squared	0.51	F-statistic		7.49
Adjusted R-squared	0.44	D-W Statistics		2.02

NOTE: Prob. reflects the level of significance.

EDUCATION AND FERTILITY

There are several plausible reasons why women with some secondary education for example, usually display a lower fertility rate than the uneducated. To summarize very briefly, and without professing to produce a complete list of mechanisms, fertility desires are thought to have been influenced by the individual woman's education because of the following reasons:

[11]Married women (Below Secondary) variable consists of all married women age 15-49 who could not complete secondary education.

(1) the high opportunity costs of childbearing involved in some types of work that may be offered to the better-educated woman,

(2) the cash expenses and children's reduced contribution to domestic and agricultural work as a result of children's schooling, which tends to be encouraged by the educated mother (quality vs. quantity of children),

(3) the reduced need for children as old age security,

(4) the higher prevalence of nuclear families, which may reduce fertility partly because childbearing costs are high due to the absence of economies of scale,

(5) stronger preferences for consumer goods or other sources of satisfaction, and

(6) a lower infant and child mortality, influencing desires through replacement (Kravdal, 2000).

One reason why education may operate through these channels is that schooling makes the woman able to read and write, increases her knowledge about the outside world, and provides her with certain practical and theoretical skills that enhances her productivity. In addition, a woman's position relative to a man may be involved. While their 'economic autonomy', 'physical autonomy' and 'decision-making autonomy' (Jeheebhoy, 1995) are likely to depend to a large extent on community norms and institutional structures, there may also be individual variations determined by individual factors. If she has an education, she may, for example, be allowed by the family to work outside. This will add to the effect of her literacy and skills, and possibly reduce fertility desire (Kravdal, 2000).

FEMALE LABOUR FORCE AND FERTILITY

Female labour force participation portrays a negative relationship with the fertility rate, but the coefficients are statistically not significant. This result confirms the recent literature on relationship between female labour force and fertility in developing countries (Hill, 1983, 1989; Tiefenthaler, 1994). The literature shows that in particular, self-employment can allow women to generate income while simultaneously taking care of their children and other household responsibilities. Even within wage employment, public sector employment often involves shorter hours and the presence of child care facilities that makes it more compatible with child rearing. Other factors also affecting the relationship between women's employment and fertility, such

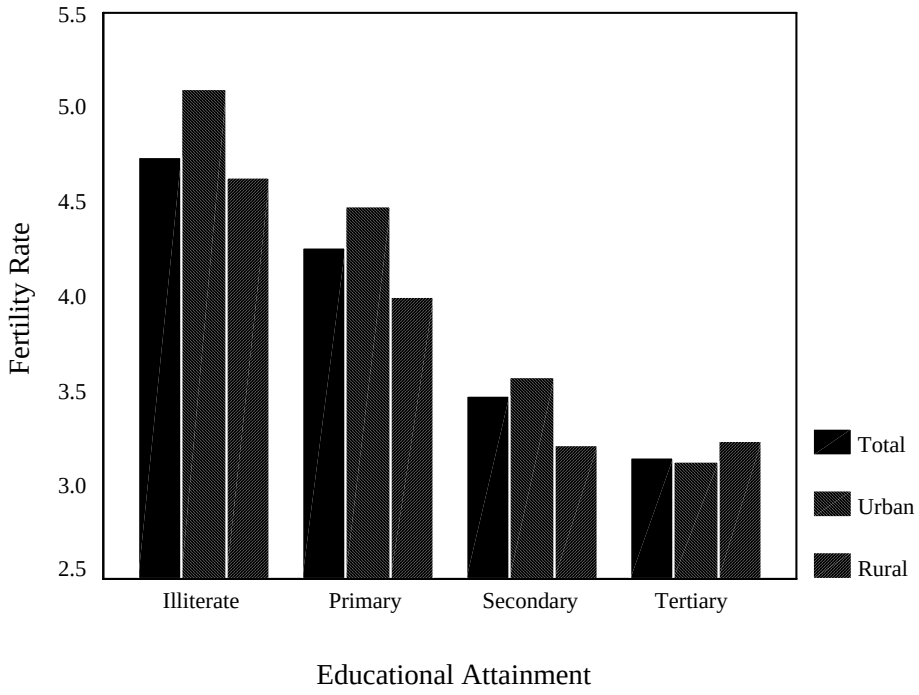
as the socio-cultural and macro economic contexts in specific areas, are more identified.

INFANT MORTALITY AND FERTILITY

The coefficient of Infant Mortality Rate, in all regression confirms a direct relationship with the fertility rate. However, the marginal effect seems very small. Aside from reflecting various household characteristics (such as maternal education and income), childhood mortality is likely to be associated with the quality of the household's environment, including its access to safe drinking water (*see*, for example, Rosenzweig and Wolpin, 1982).

FIGURE 1

Fertility Rate and Educational Attainment of Married Women



Source: Pakistan Population Census, 1998

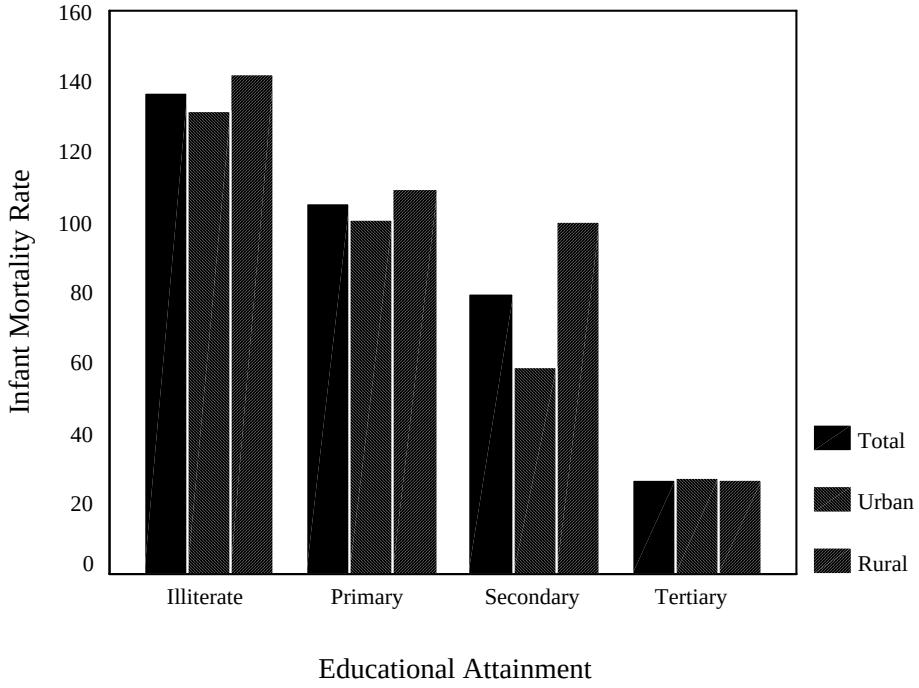
Figure 1 portrays an obvious relationship between fertility and the educational attainment of married women. One important observation emerges. Although the educational attainment below secondary level reduces

fertility, the impact is not so pronounced as in the case of higher education. This observation provides a strong rationale for higher education for women.

As the Census data do not provide information regarding infant mortality by the level of education of the mother, Figure 2 is plotted using the data from Pakistan Integrated Household Survey (PIHS). Similar trends are evident from this graph. However, the decline in infant mortality rate at the highest level of education, *i.e.*, 'tertiary', is much sharper than in the case of fertility. Particularly, in the rural context, this is the only education category that significantly affects the decrease in the infant mortality rate.

FIGURE 2

Infant Mortality Rate and Educational Attainment of Married Women



Source: PIHS data, 2001-2002

The above discussed graphs, albeit while indicating an important link between fertility and educational attainments of married women, do not control for other possible interactions which may affect the fertility rate. For instance, they do not control for the level of the district's development, available health facilities, female labour force participation, etc; therefore, a macro model (equation 1) of fertility at district level is estimated to quantify

the net impact of aggregate district education level and percentage education level of married women on the reduction of the fertility rate.[12]

The improvements in male education may also negative impact on fertility. This study is also proved this hypothesis. However, the impact of male education on fertility is likely to be smaller than that of female education, because women bear the primary responsibility for child-rearing. It is also possible, in principle, for male education to matter more than female education, *e.g.* if fertility decisions are dominated by men. However, this does not seem to be the case in practice. Indeed, most of the studies that have investigated both effects support the hypothesis that female education has a greater impact on fertility than male education.

In this study, the sign of 'proportion of urban population' is negative and significant in Table 2. The role of urbanization has also been emphasized in the literature (*e.g.*, Schultz 1994). Urbanization is believed to reduce fertility because children are less likely to contribute to household production and more difficult to supervise in an urban setting. In so far as fertility decline is in part a 'diffusion process', it is also likely to proceed at an accelerated pace in urban areas, where people have greater exposure to electronic and print media as well as wider opportunities to observe and discuss the lifestyles of other social groups.

In this study, two specifications are used to quantify the impact of women's schooling on the aggregate fertility rate. In the first specification, the proportion of literate (formal schooling) married women is used irrespective of the level of educational attainments (Version 1), while in the other specification, two alternative variables are used; first, the proportion of married women in a district, who have education below the secondary level, and second, those who have obtained secondary or higher education (Version 2).

Results indicate significant impacts of education on women's fertility. The coefficient associated with 'Literate Married Women' is negative and is highly significant. But more importantly, the marginal effects of 'Married Women – Secondary or higher' is striking. The coefficient is approximately 4 times higher than that associated with the 'Married Women – Below

[12]The Index of Economic Development represents the overall level of the district's development and it is not feasible to prepare separate development indices for rural and urban areas. Therefore, the analysis is restricted to total district fertility rate.

Secondary' category. These results clearly justify the case of higher education to women.

IV. CONCLUDING REMARKS

The main objective of this empirical investigation was to observe and quantify the impact of women's education on fertility using aggregate cross-section data for the districts of Pakistan. The objective is achieved by estimating a macro model of fertility with variables, School Life Expectancy at the district level, Education of Married Women, Index of Economic Development, District Health Status, Female Labour Force Participation, Infant Mortality Rate, and some locational and regional variables.

The fact that a women's education influences her fertility, and is usually negative, is firmly established in a macro scenario. The study also noticed the importance of higher education in reducing fertility. An additional fertility-depressing effect of the general educational level in the community, net of its aggregate determinants, is certainly not intuitively implausible either. However, such a spill-over effect from educational investments has yet to be well demonstrated empirically. In this study, negative but statistically insignificant effects of aggregate female education and positive impact of aggregate male education on fertility are found.

As a byproduct, the study also exhibited a weak relationship between health and reproductive health facilities and fertility rate in Pakistan. While positive but with low marginal effects, higher infant mortality rates also add to the aggregate fertility. The economic condition of the districts and fertility holds a cubic relationship. Fertility rates are negative with the low and high levels of development.

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THE DIRECTION OF CAUSALITY BETWEEN HEALTH SPENDING AND GDP
The Case of Pakistan

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Abstract. Relevant literature suggests that the most important determinant of health care spending is real *GDP*. Moreover, there is considerable evidence that health care spending rises at a faster rate than real *GDP*. This paper uses recently developed tests for the existence of a long run relationship to analyze the links between health care spending and *GDP*. We are, particularly, interested in estimating the elasticity parameter. The aim of the paper is to provide a new method of analysis to those used in recent papers on this subject. Typically in applied analysis, testing for the existence of cointegration and causality can only be carried out once the time series properties of the data have been established. For example, tests for cointegration require the variables to integrated of the same order, typically I(1), prior to estimation. By eliminating the need for unit root pre-testing, the tests applied here considerably simplify the inference procedure. They also reduce the potential for distortions in the inference due to the unknown properties of the testing sequence. Our findings include robust evidence that, for Pakistan, the income elasticity for health care spending is greater than one and that the elasticity value is stable over the estimation period.

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Note: The views expressed in this working paper are the authors' personal views and do not necessarily reflect those of the State Bank of Pakistan. The authors of this paper welcome comments and suggestions.

I. INTRODUCTION

In all developing economies since the 1960s, there has been considerable concern about the increasing proportion of *GDP* devoted to health care spending. As a result, much research has focused on the identification of the factors that contribute to increases in health care spending. The factor that has been identified as the most influential is real *GDP*. In this study, we focus on two issues. The first is an empirical examination of the relationship between real health care spending per capita (*HCS*) and real *GDP* per capita (*GDP*). In this examination, we are interested in the robustness of the relationship between *HCS* and *GDP* over time. The second issue of interest is related to the observation that health care spending may for some economies and for some time periods rise at a faster rate than real *GDP*. If this is the case, the income elasticity of health care spending is greater than one.

There are a number of possible reasons for a positive relationship between the wealth of an economy, as measured by real *GDP*, and the amount spent on health care. First, increased income means that there is more money to spend on health both in the public and private sectors. Second, more health spending may lead to better health status, which may in turn cause higher income. Healthier workers are more productive and hence the economy as well as individuals have more income. This implies that the causal relationship between *HCS* and *GDP* may run in either or both directions. Finally, there may be some associative factor, which causes both better health and higher income. An example would be increased education levels in an economy which increase demand for *HCS* and independently, increase income.

The rest of the paper is organized as follows: A brief study of previous empirical studies is presented in section II. Section III provides data and methodology. Robust empirical findings are discussed in section IV and the main conclusions are stated in section V.

II. REVIEW OF RELEVANT LITERATURE

Until recently much of the focus of applied analysis on the relationship between *GDP* and *HCS* has been on results from pooled cross section data from the OECD countries (see for example, Gerdtham, Søgaard, Andersson and Jönsson, 1992). Recent work has, however, cast some doubt on the validity of the pooling restrictions. Blomqvist and Carter (1997, p. 226) after an extensive econometric analysis of the data in an attempt to estimate the income elasticity of demand for health, conclude by noting that "pooling restrictions are of very doubtful validity." Further questions on the validity of

pooling the data come from three recent papers, which analyze the time series properties of the data. Hansen and King (1996) use standard Augmented Dickey-Fuller (ADF) tests for unit roots and Engle Granger tests for cointegration using OECD data on *HCS*, *GDP* and a variety of other variables thought to influence health care spending. They find that the time series properties of the data varies between countries. Thus, for example, their results suggest that *HCS* in Pakistan is I(0), in France it is I(1) and in Norway it is I(2). Using individual country analysis they find little evidence of cointegration between the variables, casting doubt on previous empirical work which used OLS estimation. If we take these results at face value then they clearly confirm Blomqvist and Carter's conclusion that it makes no sense to pool data where the basic time series properties of the data are of such different orders of integration.[1]

In a related paper, McCoskey and Selden (1998) use recently developed tests for a unit root in a panel setting. The test they use, that of Im, Pesaran and Shin (1997), takes advantage of increased power due to the pooling of the data but has the advantage of allowing a degree of heterogeneity in the data generating process of the individual elements of the panel. This last point needs further consideration. When testing for unit roots, two key decisions need to be made. The first is what deterministic variables to include in the regression model in which the unit root null is to be tested. This decision depends in part on the assumption made about the unknown data generating process. For example, an assumption is made about whether the variable is a random walk or random walk with drift for example. An incorrect decision can lead to a loss of power and the possibility that the test statistic will not have the tabulated Dickey Fuller distribution. The second decision concerns lag orders in the ADF to ensure that the residuals of the test regression are not auto-correlated, again some decision must be made from observation of the diagnostics of the test regression. This is the heterogeneity that the Im, Pesaran and Shin (1997) test makes allowance for. Each series can be tested using a different set of deterministic variables and differing lag order in the ADF and this is a significant improvement over previous tests. The problem is, as pointed out in Hansen and King's (1998) comment to the paper by McCoskey and Selden (1998), that the null hypothesis in the panel based unit root test is that all of the series in question

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[1]The most recent developments in the analysis of panel data may provide solutions to these problems, *see*, for example, Banerjee (1999).

are I(1) whilst the alternative is that they are all I(0). Clearly it is possible, as Hansen and King (1998) point out that such tests could lead to the rejection of the unit root null even when it was the case that some of the individual series could not reject the unit root null. Clearly this is an important issue. The test is not applicable in cases where the heterogeneity stretches to series with differing orders of integration.

Roberts (1999) in her summary of the papers mentioned above, identifies three weaknesses in the estimation procedures which have been used to explore the relationship between *GDP* and *HCS*. First, the use of cross sectional data imposes homogeneity on the institutional characteristics of countries used in the sample, whereas there are considerable differences between the way health care is funded and organized in different economies. The second weakness is the failure of much modeling to take into account the dynamics in the relationship though the use of an appropriate lag structure. The third weakness is the difficulty of dealing with variables that are non-stationary. We account for all these weaknesses in our analysis.

We believe that the above discussion validates our decision to analyze the data from an individual country, time series perspective. Clearly this involves a loss of power compared to the panel based approach, but we believe that the problem of the possible heterogeneity of the panels justifies our approach. Weighed against this is the fact that our testing procedures obviate the need for pre-testing the variables for unit roots. Typically in applied analysis, testing for the existence of cointegration and causality can only be carried out once the time series properties of the data have been established. For example, tests for cointegration require the variables to be integrated of the same order, typically I(1), prior to estimation. Similarly tests for causality are influenced by the need to know about the unit root and cointegration properties of the data. By eliminating the need for unit root pre-testing, the tests applied here considerably simplify the inference procedure. They also reduce the potential for distortions in the inference due to the unknown properties of the testing sequence.

III. METHODOLOGY AND DATA

This paper uses recently developed tests for the existence of a long run relationship to analyze the links between *HCS* and *GDP* using Pakistan's time series data taken from the *Pakistan Economic Survey* and *Annual Reports* (various issues). This data series is annual from 1972 to 2005 and thus comprises 33 years of observations.

ESTIMATION TECHNIQUES

The first test applied to the data is the one suggested in Pesaran, Shin and Smith (1999). This tests for a long run relationship between the variables and is applicable irrespective of whether the regressors are I(0), I(1) or mutually cointegrated. The test is based upon estimation of the underlying VAR model, re-parameterized as an ECM (error correction model).[2]

The VAR(p) model:

$$z_t = b + ct + \sum_{i=1}^{p} \Phi_i z_{t-i} + \varepsilon_t \tag{3.1}$$

where z represents a vector of variables. Under the assumption that the individual elements of z are at the most I(1), or do not have explosive roots, equation (3.1) can be written as a simple Vector ECM.

$$\Delta z_t = b + ct + \Pi z_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta z_{t-i} + \varepsilon_t \tag{3.2}$$

where $\Pi = -\left(I_{k+1} - \sum_{i=1}^{p} \Phi_i \right)$ and $\Gamma_i = -\sum_{j=i+1}^{p} \Phi_j, i = 1, \ldots . p-1$ are the $(k+1) \times (k+1)$ matrices of the long run multipliers and the short run dynamic coefficients. By making the assumption that there is only one long run relationship amongst the variables, Pesaran *et al.* focus on the first equation in (3.2) and partition z_t into a dependant variable y_t and a set of forcing variables x. This is one of the key assumptions of their paper. Under such conditions the matrices b, c, Γ and, most importantly, Π, the long run multiplier matrix can also be partitioned conformably with the partitioning of z.

$$\Pi = \begin{bmatrix} \pi_{11} & \pi_{12} \\ \pi_{21} & \Pi_{22} \end{bmatrix} \quad b = \begin{bmatrix} b_1 \\ b_2 \end{bmatrix} \quad c = \begin{bmatrix} c_1 \\ c_2 \end{bmatrix} \quad \Gamma_i = \begin{bmatrix} \gamma_{11,i} & \gamma_{12,i} \\ \gamma_{21,i} & \gamma_{22,i} \end{bmatrix}$$

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[2]Most of the following is based on Pesaran, Shin and Smith (1999) and follows their original notation.

The key assumption, that x is long run forcing for y, then implies that the vector $\pi_{21} = 0$, that is that there is no feedback from the level of y on Δx. As a result the conditional model for Δy and Δx can be written as

$$\Delta y_t = b_1 + c_1 t + \pi_{11} y_{t-1} + \pi_{12} x_{t-1} + \sum_{i=1}^{p-1} \gamma_{11,i} \Delta y_{t-i} + \sum_{i=0}^{p-1} \boldsymbol{\gamma}_{12,i} \boldsymbol{\Delta} x_{t-i} + \varepsilon_{1t} \qquad (3.3)$$

$$\Delta x_t = b_2 + c_2 t + \boldsymbol{\Pi}_{22} x_{t-1} + \sum_{i=1}^{p-1} \gamma_{21,i} \Delta y_{t-i} + \sum_{i=1}^{p-1} \boldsymbol{\Gamma}_{22,i} \boldsymbol{\Delta} x_{t-i} + \boldsymbol{\varepsilon}_{2t} \qquad (3.4)$$

Under standard assumptions about the error terms in (3.3) and (3.4)[3] Pesaran *et al.* re-write (3.3) as

$$\Delta y_t = a_0 + a_1 t + \phi\, y_{t-1} + \delta\, x_{t-1} + \sum_{i=1}^{p-1} \upsilon_i \Delta y_{t-i} + \sum_{i=0}^{p-1} \varphi_i \Delta x_{t-i} + \varpi_t \qquad (3.5)$$

which they term an unrestricted error correction model. Note that in (3.5) a long run relationship will exist amongst the levels variables if the two parameters ϕ and δ are both non zero in which case, for the long run solution of (3.5) we obtain

$$y_t = -\frac{a_0}{\phi} - \frac{a_1}{\phi} - \frac{\delta}{\phi} x_t \qquad (3.6)$$

Pesaran *et al.* choose to test the hypothesis of no long run relationship between y and x by testing the joint hypothesis that $\phi = \delta = 0$ in the context of equation (3.5). The test they develop is a bounds type test, with a lower bound calculated on the basis that the variables in x are I(0) and an upper bound on the basis that they are I(1). Pesaran *et al.* (1999) provide critical values for this bounds test from an extensive set of stochastic simulations under differing assumptions regarding the appropriate inclusion of deterministic variables in the ECM. If the calculated test statistic (which is a standard F test for testing the null that the coefficients on the lagged levels terms are jointly equal to zero) lies above the upper bound, the result is conclusive and implies that a long run relationship does exist between the

[3]Essentially that they are independently normally distributed with a positive definite variance covariance matrix.

variables. If the test statistic lies within the bounds, no conclusion can be drawn without knowledge of the time series properties of the variables. In this case, standard methods of testing would have to be applied. If the test statistic lies below the lower bound, no long run relationship exists.

EMPIRICAL FINDINGS

In the context of the above discussion a key element of the testing strategy is the assumption that the variables contained in *x* are long run forcing for *y*. Clearly in many applications, such information is not available *a priori*. To counter this problem, Pesaran *et al.* advance a testing strategy which assumes no particular ordering of the variables into *x* and *y* vectors and requires estimation of the ECM in all of its inversions. Whilst it may seem reasonable to assume that HCS is not a long run determinant of *GDP* and hence that estimation and testing could take place in a regression of the form below in equation (3.7), we do estimate the model with both ΔGDP and ΔHCS as the dependant variable. Our prior is that if there is a long run relationship between the two variables the F test will be significant when ΔHCS is the dependant variable and not significant when ΔGDP is the dependant variable. This would indicate that *GDP* is long run forcing for *HCS* but not *vice versa.*

Two further aspects of the regression equation need specifying in practice. First we specify the lag order, *k* in the regression. We started testing with a maximum lag of 2 and used information criteria and sequential F tests along with tests for residual autocorrelation to guide our lag choice. Since this is annual data and we wish to preserve as many degrees of freedom as possible, this seems a reasonable maximum lag order. The second decision regards the inclusion of deterministic constant and trend terms. We report here tests based on a model with an unrestricted constant, since we found no evidence of a significant deterministic trend in the relationship. We based our decision on lag order on the observation of both the information criteria, an F test of the reduction (from 2 lags to 1 lag) and the autocorrelation test.

$$\Delta HCS_t = \alpha_0 + \alpha_1 HCS_{t-1} + \alpha_2 GDP_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta HCS_{t-i} + \sum_{i=0}^{k} \delta_i \Delta GDP_{t-i} \tag{3.7}$$

Tests of the null hypothesis of no long run relationship can thus be carried out using an F test of the null that $\alpha_1 = \alpha_2 = 0$.

TABLE 1

Results for estimation of Equation 3.1 with lag orders k = 1,2

Constant only, Dependant variable Δ*HCS*

Lag order	SC	HQ	LM AR(1-2)	F test on Reduction
K = 2	–6.352	–6.585	[.02]*	
K = 1	–6.545	–6.720	[.58]	[.87]

Constant only, Dependant variable Δ*GDP*

Lag order	SC	HQ	LM AR(1-2)	F test on Reduction
K = 2	–6.998	–7.231	[.31]	
K = 1	–7.190	–7.365	[.66]	[.86]

NOTE: Figures in square brackets are p values.

From the results in Table 1, lag order, $k = 1$, seems appropriate as both information criteria select $k = 1$, the F test does not reject the reduction in lag order from 2 to 1 and there is no evidence of serial correlation in the residuals. Table 2 shows the F tests for the restrictions that the lagged terms are jointly zero. When Δ*HCS* is the dependant variable, we reject the null of no long run relationship between the variables, but do not reject it when Δ*GDP* is the dependant variable, implying that a long run relationship does exist and that it is *GDP* that is long run forcing for *HCS*.

TABLE 2

F Test for the Existence of a Long Run Relationship
Constant only

Dependant variable	F statistic
Δ*HCS*	6.53
Δ*GDP*	3.04

NOTE: 95% critical bounds for the F test: 4.94 – 5.73[4]

[4]Critical bounds are from Table C1.iii of Pesaran *et al*. (1999).

The estimated regression, with ΔHCS as the dependant variable for the sample period 1972 to 2005 is:

$$\begin{aligned} HCS = {} & -2.043 + 0.1636\,\Delta HCS_{t-1} + 0.1351\,\Delta GDP \\ & [0.5782] \quad [0.1826] \quad [0.2162] \\ & -0.2143\,\Delta GDP_{t-1} + 0.5488\,GDP_{t-1} - 0.3122\,HCS_{t-1} \\ & [0.2807] \quad [0.1511] \quad [0.08439] \end{aligned}$$

$R^2 = 0.42473$, F = 4.2822 [0.0049], DW = 1.97

Since the evidence suggests there is a long run relationship between *HCS* and *GDP*, we estimated the long run relationship using the autoregressive distributed lag (ARDL) method suggested in Pesaran, Shin and Smith (1999).[5] A maximum lag order of 3 was allowed in the ARDL model and we used the Schwarz Bayesian Criteria to select optimal lag orders. In this case, an ARDL (1,0) model was selected and the estimated long run relationship was of the form:

HCS =	–6.53 +	1.76 *GDP*
se	(0. 760)	(0. 140)
t	(–8.06)	(12.59)

The coefficient on GDP is highly significant. It is also of interest that the 99% confidence interval around the estimated coefficient does not include 1, implying that the elasticity of demand for health care in Pakistan is greater than 1 and thus implies that people can spend more on this because it is a necessity good. This finding is consistent with the results in Blomqvist and Carter (1997). Furthermore, we find evidence that there is a long run relationship between *GDP* and *HCS* and direction of the relationship runs from *GDP* to *HCS*.

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[5]This method is, once again, applicable irrespective of whether the regressors are I(0) or I(1). The long run estimates and their standard errors were obtained using Microfit 4.0. (Refer to Pesaran and Pesaran, 1997). This uses Bewley's (1979) regression method to estimate the asymptotic standard errors and is equivalent to the so-called 'delta' method (*see*, for example, Greene, 1993, p. 297). Monte Carlo experiments in Pesaran and Shin (1999) suggest that the ARDL approach may well be preferable to other estimators such as Fully Modified OLS (Phillips and Hansen, 1990) in small samples.

IV. THE ROBUSTNESS OF THE RESULTS

Whilst the key element of our testing procedure so far is to test for the existence of a long run relationship without the need to pre-test for unit roots it does seem prudent to carry out further, more standard tests, to establish the robustness of the above results. Since the above tests do depend on a number of assumptions, such as the weak exogeneity status of *GDP* and the assumption that the maximum order of integration is I(1), we re-examine the relationship using the Johansen maximum likelihood method of testing for cointegration. We bear in mind throughout that whilst the span of our data is good we are carrying out these tests with a smaller number of observations than is desirable. Against this we note that the results below prove to be so close to those obtained above that we believe they serve to strengthen our conviction in the numbers produced.

The standard ADF tests for a unit root in the log levels and first differences of the data both confirm the assumption that *HCS* and *GDP* are both I(1). On the basis of this confirmation, we proceed to the Johansen estimation. Before carrying out the estimation, we need to establish a valid lag order in the levels of VARS of the variables.

Once again, because the data are annual and the degrees of freedom are small, we estimated a VAR with the variables expressed in levels, and including a constant and a maximum of two lags of *HCS* and *GDP*. A simple model reduction using a VAR reduction sequence suggests that a VAR(1) is in fact adequate and has acceptable diagnostics.

TABLE 3

Johansen's Test for Cointegration

No. of cointegrating vectors	Max. Eigen value Statistic	Adjusted Statistic	5% critical value	Trace test statistic	Adjusted statistic	5% critical value
= 0	19.02*	17.99*	14.1	22.51*	21.29*	15.4
≤ 1	3.488	3.3	3.8	3.488	3.3	3.8

NOTE: Estimation sample 1972 to 2005, constant entered unrestricted, no trend.

Table 3 reports the results of the Johansen maximum likelihood method of testing for cointegration. The results suggest that there is a single cointegrating vector between variables. The constant enters the estimation unrestricted to allow for possible non-zero drift in the series. The estimated cointegrating relationship yielded a coefficient on *GDP* (when normalized)

of 1.695 implying a long run elasticity in accordance with that obtained using the ARDL approach. One advantage of the Johansen method at this stage is its ability to test restrictions on the cointegrating vector. Under the assumption that the rank of $\alpha\beta = \Pi$ (the long run matrix) is unity we carry out two types of tests. First, we restrict the β matrix so that only one of the variables entered the cointegrating relationship. For example, we restrict the coefficient on *HCS* to be zero and that on *GDP* to be arbitrarily one. This tests the null that the unrestricted variable is I(0) (cointegration with a single variable). This is often referred to as the multivariate test for stationarity. Table 4 reports the results. The strong rejections of the null support the results of the ADF tests that the variables are both I(1). Second, by appropriate restrictions on the α matrix we can test the weak exogeneity assumption important in the ARDL test. Once again these tests suggest that we cannot reject the hypothesis that the cointegrating relationship only enters in the *HCS* equation of the system, supporting the notion that *GDP* is weakly exogenous and that the restriction assumed above in the ARDL testing is valid.

TABLE 4

Tests for a Unit Root and Weak Exogeneity

	LR test ($\chi^2(1)$)
Unit root for *GDP*	12.84 [.00]
Unit root for *HCS*	10.65 [.00]
Weak exogeneity *GDP*	0.92 [.34]
Weak exogeneity *HCS*	14.97 [.00]

Both sets of tests show evidence of a long run or cointegrating relationship between the two variables of interest. The fact that both of the tests produce similar estimates of the income elasticity adds weight to our conclusion that in Pakistan, people spend more on health care because it is a necessity good.

Whilst we have estimated parameters for the long run relationship we have not, at this stage tested for their stability, in order to do so we used the tests described in Hansen (1992). Hansen details three tests of parameter instability in the context of a regression involving I(1) variables, these are the SupF, MeanF and L_C tests. Hansen shows that the latter test can be used as a test of the null of cointegration, thus providing us with a further check of the

cointegration result obtained above. In order to implement these tests we use the GAUSS program along with a program written specifically to carry out the tests mentioned above by Hansen.[6] The method also requires the use of the FM-OLS type estimators of cointegrating relationships suggested by Phillips and Hansen (1990), providing a further check on the results above.

Firstly, the FM-OLS results were:

$$HCS_t = \underset{(0.06)}{-6.76} + \underset{(0.32)}{1.78}\ GDP_t$$

Once again these results are very close to the estimates obtained from the other methods. None of the three parameter stability tests reject the null hypothesis of stability. The L_C test fails to reject the null of cointegration, once again supporting the idea of a long run relationship between the two variables.

Finally, since all of the above appears to confirm the existence of a long run relationship, we use the estimated regression to form an error correction term and estimate a simple dynamic ECM for health care spending. The estimated regression is reproduced below with a standard range of diagnostics. Since all of the regressors are I(0), either due to first differencing or construction (in the case of the ECM), Hansen's (1992) tests for parameter stability are applicable. These show no evidence of instability in either individual parameters or the regression as a whole.

TABLE 5

Error Correction Model for *HCS*

Variable	Coefficient	Std. Error	t-value	Instab
Constant	–0.0042558	0.010498	–0.405	0.07
ΔHCS_{t-1}	0.16366	0.14345	1.141	0.09
ΔGDP_t	0.13580	0.22960	0.591	0.21
ΔGDP_{t-1}	–0.21430	0.27813	–0.771	0.06
ECM_{t-1}	–0.31246	0.085008	–3.676	0.10

$R^2 = 0.424729$, F (4,30) = 5.5373 [0.0018], DW = 1.97

[6]The program is available from Prof. Hansen's home page at: http://www.ssc.wisc.edu/~bhansen/

The error correction term is correctly signed and significant. The value of the coefficient on the ECM indicates that a change in real *GDP* brings about a 31% change in *HCS* in a year. Alternatively, it takes approximately 3 years for any deviation from the long run relationship between *HCS* and *GDP* to be corrected after a change in GDP. The ECM also passes a range of diagnostic tests.

V. CONCLUSIONS

Our results support the hypothesis that over the period 1972 to 2005, *HCS* in Pakistan rose at a faster rate than *GDP*. The value and sign of the income elasticity on health care spending is confirmed by three different test procedures. Importantly, our results in section 4 of the paper support the size and sign on the elasticity over the entire sample period. We also find strong support for the exogeneity of *GDP* and the existence of a long run relationship between *GDP* and *HCS*. The ECM for the relationship between *HCS* and *GDP* supports a three year adjustment period to equilibrium after a change in *GDP*.

Our analysis of the relationship confronts all three criticisms made by Roberts (1999). Rather than make the questionable assumptions involved in aggregation into panels we chose to analyze the relationship between *GDP* and *HCS* on a single country basis, using Pakistan as our first subject. Further, we consider the dynamics of the relationship between *HCS* and GDP by a careful consideration of the appropriate lag structure at all stages of our analysis. Finally, our techniques consider the stationarity of the variables.

Given the nature of the available data, drawing inferences about the determinants of health spending is a process fraught with difficulty. The main difficulty we have faced is with the number of observations available. In order to alleviate the data problems as much as possible we use a recently developed test for the existence of a long run relationship between time series which conserves degrees of freedom in pre-tests for unit root characteristics of the data. We also acknowledge that there are limitations in the quality of the data. In particular, gross domestic product is an imperfect indicator of economic prosperity and not all improvements in health status can be attributed to changes in health care spending. Nonetheless, the size of the income elasticity on *HCS* confirms the widely accepted view that over the last 30 years, *HCS* has tended to grow at a faster rate than *GDP* in Pakistan.

Our results confirm the long held view that the most important factor that influences changes in *HCS* in an economy is changes in *GDP*. As a country grows, it has more resources to devote to the health care sector. We do not anticipate, however, that the relationship between *HCS* and *GDP* which we have described is likely to hold for future time periods. The period between 1972 and 2005 witnessed enormous advancements in medical technology, increasing community expectations and population aging. Most importantly, it was also a period when governments were more amenable to increases in the health budget and a large proportion of the health spending in Pakistan is public. There is a greater acceptance now that health resources should be rationed and that public health spending cannot continue to grow as it did over the period under review. An avenue for further research is the application of the techniques which we have used in this paper to the relationship between *HCS* and *GDP* in different countries and also to future time periods for the Pakistan's economy.

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