PDR

The PAKISTAN DEVELOPMENT REVIEW

Volume 48 **Summer 2009** **Number 2**

www.pide.org.pk

PDR **The PAKISTAN DEVELOPMENT REVIEW**

Volume 48 Number 2
Summer 2009

C O N T E N T S

© *The Pakistan Development Review*
48 : 2 (Summer 2009) pp. 109–123

Foreign Portfolio Investment and Economic Growth in Malaysia

JARITA DUASA and SALINA H. KASSIM

This study examines the relationship between foreign portfolio investment (FPI) and Malaysia's economic performance. In particular, the study analyses the relationship between FPI and real gross domestic product (GDP) using the widely adopted Granger causality test and the more recent Toda and Yamamoto's (1995) non-causality test to establish the direction of causation between the two variables. Similar method is also applied on the relationship between volatility of FPI and real GDP. Additionally, the study uses an innovation accounting by simulating variance decompositions and impulse response functions for further inferences. Using quarterly data covering the period from 1991 to 2006, the study finds evidence that economic growth causes changes in the FPI and its volatility and not vice versa.. The findings suggest that economic performance is the major pull factor in attracting FPI into the country. Thus, it must be ensured that the Malaysian economy remains on a healthy and sustainable growth path so as to maintain investor confidence in the economy.

JEL classification: G15, C32, C12
Keywords: Foreign Portfolio Investment, Economic Growth, Granger Causality, Toda-Yamamoto Non-causality, Variance Decomposition

1. INTRODUCTION

Amid several incidences of economic and financial crises in the 1990s and 2000s, there has been renewed research interest in analysing the impact of foreign portfolio investment (FPI) on the economic well-being of a host country. While it is widely accepted that investment flow has its own benefits, lessons learned from the financial crises highlighted that short-term FPI could have adverse effects on the host economy. It is therefore critical to analyse the extent to which a country could benefit from the inflow of FPI.

In general, the merits of capital market integration through liberalisation of investment regulations are well-documented in the literature. FPI contributes positively in the development of an efficient domestic capital market and brings several benefits to the host country. Increased FPI leads to greater liquidity in the capital market, resulting in a

Jarita Duasa <jarita@iiu.edu.my> is Associate Professor, Department of Economics, Kulliyyah of Economics and Management Sciences, International Islamic University Malaysia, Kuala Lumpur, Malaysia. Salina H. Kassim <ksalina@iiu.edu.my> is Associate Professor, Department of Economics, Kulliyyah of Economics and Management Sciences, International Islamic University Malaysia, Kuala Lumpur, Malaysia.

deeper and broader market [Levine and Zervos (1996)]. The spill-over effects of positive competitive pressure to attract foreign investment would necessitate higher industrial standards and regulations through better corporate governance and greater business transparency, resulting in stronger investor protection and thus enhanced investor confidence [Feldman and Kumar (1995); Shinn (2000)]. Increased liquidity in the capital market also means better access to financing at lower cost of capital which is crucial to support economic activity [La Porta, *et al*. (1998); Bekaert and Harvey (2003)]. In this regard, the inflow of FPI into the stock market helps to alleviate financial constraints of firms [Laeven (2003); Knill (2004); Beck, Demirguc-Kunt, and Maksimovic (2005)]. Studies relating to FPI and the domestic stock markets show favourable contribution of FPI in supporting the domestic stock market [see for example, Patro and Wald (2005); Kim and Singal (2000)]. The multiplier effect further propagates the impact of growth in the stock market through the wealth effect. In this sense, capital flows act as catalyst to economic growth and contribute towards increased wealth creation. Ultimately, better access to financing provided by the free flow of portfolio investments contributes to efficient allocation of capital [Wurgler (2000); Love (2003); Rajan and Zingales (1998)].

Despite its numerous virtues, FPI could have adverse effects on the host economy. The potentially damaging aspects of FPI are rooted in its nature which is short-term and thus also volatile. In particular, FPI volatility has often been quoted as the major reason behind financial market distress, leading to financial crisis. Lessons learned from the Asian financial crisis of 1997-1998 show that large and abrupt reversal of portfolio investment often causes panic in the financial market, since it is taken as a manifestation of impending financial crisis [Knill (2004); Sula and Willet (2006)]. More importantly, as highlighted by Henry (2003) and Demirguc-Kunt and Detragiache (1999), based on the experience of many countries which experienced financial crisis, the volatility of portfolio investment further exacerbates the impact of a financial crisis. FPI instability complicates the implementation of macroeconomic stabilisation policies by the policy-makers. Uncertainties in the flow of FPI result in unpredictable behaviour of money supply, exchange rate level and stock market volatility [Patro and Wald (2005)]. In particular, sustained periods of excessive capital inflows due to high capital mobility could result in the formation of asset price bubbles, leading to inflationary pressure, while sudden withdrawals in portfolio investment accompanied by major correction in asset prices can pose serious risk to the economy [Bank Negara Malaysia (2006)].

In view of its benefits and costs, a number of studies support the view that the benefits of FPI are long-term with some adverse effects in the initial stage of the process. The long-term gains of FPI outweigh its short-term ill effects and bring real benefits to the growth and development of the domestic financial markets and the economy in general [Kaminsky and Schmukler (2001)].

This study seeks to analyse FPI in the Malaysian case and provides recent empirical evidence on whether it is beneficial to the Malaysian economy or otherwise. Using a battery of tests, the study hopes to provide conclusive empirical evidence on the relationship between FPI inflow and economic growth. It is hoped that the findings of the study would contribute towards enriching the relevant literature on the relationship between foreign portfolio investment and economic growth, particularly in the case of developing countries.

The rest of the paper is organised as follows: the next section provides some background information on FPI based on the Malaysian experience. In particular, this section highlights Malaysia's experience in handling FPI during the financial crisis of 1997-1998. Section 3 presents the empirical methods. Section 4 highlights the empirical findings including the data preliminaries and the results based on the causality tests. In this section, further inferences are also drawn based on the impulse response functions and the variance decomposition analysis. Finally, Section 5 provides some concluding remarks.

2. FOREIGN PORTFOLIO INVESTMENT IN MALAYSIA

FPI in Malaysia has been substantial. During the period under review, total portfolio investment, comprising both inflow and outflow, recorded a minimum of RM8.1 billion (or 22.2 percent of nominal gross domestic product GDP) in the first quarter of 1991 and reached a maximum of RM132.8 billion (or 297.3 percent of GDP) in the fourth quarter of 1993. As shown in Figure 1, FPI has been very volatile particularly in pre-1997 period. However, the flow of FPI has become less volatile in the post-1997-1998 Asian crisis period. In terms of share in total GDP, FPI accounted for an average of around 200 percent of total GDP in the period 1991-1997 and declined gradually before stabilising at around 50 to 60 percent of GDP during 2004-2006. A clear correlation between the total FPI and nominal GDP thus could only be seen in the post-crisis period.

Analysis of the decomposition of total FPI, shows a clear correlation between portfolio inflow and outflow in the Malaysian case as shown by Figure 2. During the period under review, portfolio investment inflow moved closely in tandem with portfolio investment outflow. Yet, three interesting observations can be made. First, during the record high level of portfolio investment during 1993 to1994, the total FPI inflow exceeded the FPI outflow. This reflects the positive investor sentiment due to the economic boom experienced by Malaysia during the period. The second observation, however, reflects the adverse effects of massive portfolio outflow on the Malaysian economy as there was a large gap between inflow and outflow in the second and fourth quarter of 1997. Specifically, the net portfolio investment reached a record level of minus RM16 billion in the fourth quarter of 1997. In contrast to the massive inflow due to increased investor confidence in the 1993-1994 period, this massive outflow was due to dented investor confidence following the crisis starting in mid-1997. In line with the massive outflow, the growth of the Malaysian economy turned into a negative real GDP growth of 7.5 percent in 1998 from a positive growth of 7.5 percent in 1997.

More recent trends of FPI inflow and outflow have been encouraging. In the post-2003 period, except for the fourth quarter of 2005, inflow of FPI has been consistently greater than its outflow. This reflects the return of investor confidence in the Malaysian economy. The encouraging trend in the FPI flow reflects the pro-active government policy to instil investor confidence in the Malaysian financial markets. The Malaysian central bank—Bank Negara Malaysia (BNM)—fully acknowledges the merits of FPI, while at the same time keeping an eye on its drawbacks. In particular, BNM closely monitors any potential risks that might adversely affect investor confidence in the

financial market. The ability to detect such risks at an early stage helps BNM to act swiftly by undertaking appropriate and pre-emptive policy measures to address and mitigate their implications on the Malaysian economy [Bank Negara Malaysia (2006)].

Fig. 1. Malaysia's Foreign Portfolio Investment Inflow and Nominal GDP, First Quarter 1991—Fourth Quarter 2006

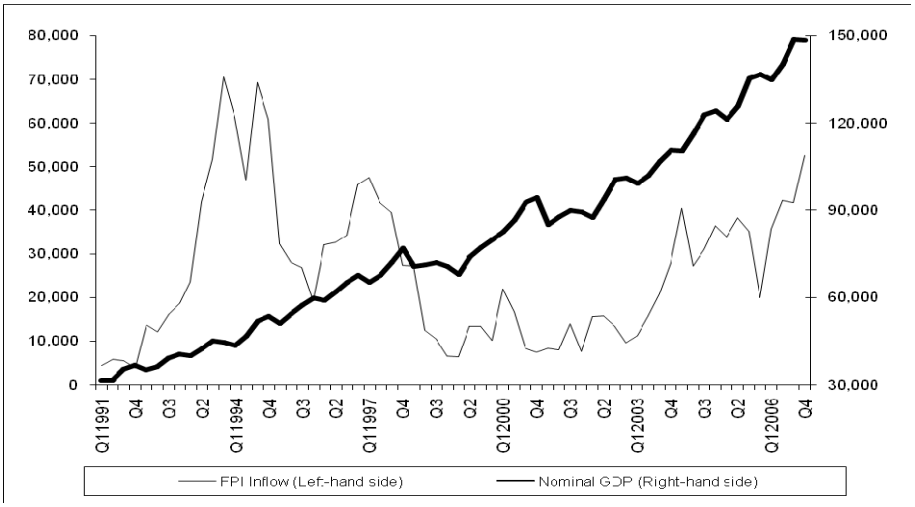
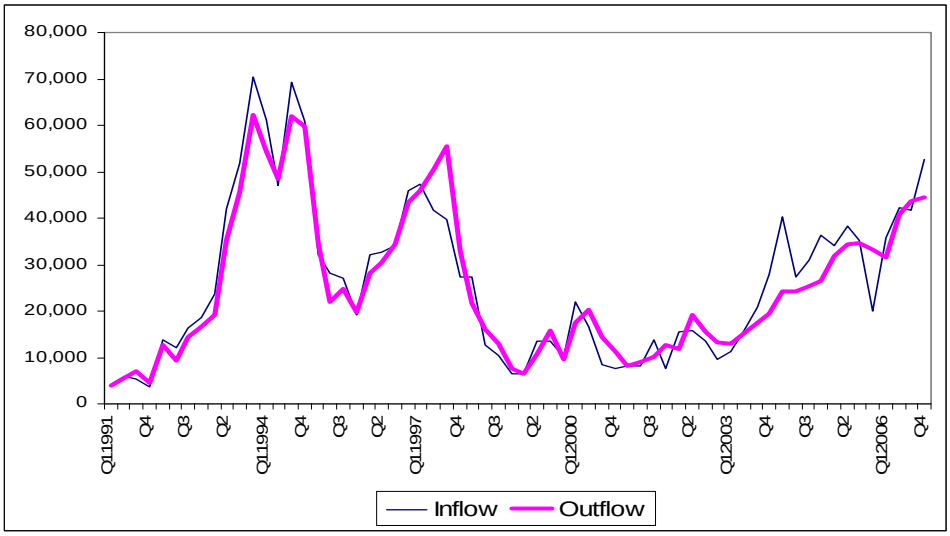


Fig. 2. Inflow and Outflow of Foreign Portfolio Investment in Malaysia, First Quarter 1991—Fourth Quarter 2006



The Malaysian government's decision to impose capital outflow controls on September 1998, after the failure of adopting the IMF proposals for one-year, has sparked a revival of interest in the use of capital controls as there is positive evidence of their implementation. Most literature, though not all, specifically registers evidence of the positive consequences of Malaysian capital outflow controls even if the actual efficiency of the measures is difficult to assess. Doraisami (2004), Athukorala (2001) and Cooper (1999) found that the Malaysian measures did lower the interest rates, which enabled monetary expansion. The controls also reduce the volatility of interest rates [Edison and Reinhart (2000)], contain capital outflow by eliminating the offshore market [Ariyoshi, *et al.* (2000); Athukorala (2001)], reduce stock market volatility [Doraisami (2004); Kaplan and Rodrik (2000); Cooper (1999)], insulate the domestic markets from international markets [Kaminsky and Schmukler (2001)], and bring faster economic recovery, smaller decline in employment and real wages and increase in foreign exchange reserves [Rodrik (1998); Cooper (1999)].

On the other hand, such controls are found to discourage capital inflows more than limiting capital outflows [Fane (2000)] and, in particular, they contribute to a weak flow of FDI to the country [Hartwell (2001)]. Furthermore, the controls are criticised on grounds of efficiency as they tend to safeguard government cronyism [Johnson and Mitton (2001)], suppress market discipline and reduce efficiency of stock market prices [Li, *et al.* (2004)]. Mixed results, however, were found by Tamirisa (2001) who shows that regulation of bank operations and foreign exchange rate transactions plus tightening controls on equity market reduce portfolio (short-term) investment, but regulation of international transaction in Ringgit increases portfolio investment.

At this point, it should be made clear that the different economic and fundamental background of Malaysia from other crisis-hit countries in the region required it to take a different path. Instead of going on with the IMF policy prescription, on September 1998, the authorities imposed sweeping controls on capital-account transactions, adopted fixed exchange rate, cut interest rates, and embarked on a policy of reflation. The steps were taken in the belief that Malaysia was facing a different type of crisis compared to other countries in the region. As substantial capital controls had already been imposed, with reserves at a lower level, the measures aimed specifically at containing Ringgit speculation and the outflow of capital by eliminating the offshore Ringgit market and at stabilising short-term capital flows. The measures also sought to increase monetary independence and insulate the economy from prospects of further deterioration in the world financial environment. Furthermore, accommodative monetary and fiscal policies were implemented to support economic activity. The financial and corporate sector reforms, which had commenced in early 1998, were accelerated to deal with the weak financial institutions and strengthen the banking system. In the 1997 Asian financial crisis, the emergency controls on outflows might have been the least bad choice for Malaysia whose currency was under severe attack from domestic and foreign speculators. Krugman (1998), for example, has argued that perhaps capital controls are sometimes the best alternative to the remedy the IMF has often prescribed in the past on a country that puts tremendous pressure on its economy and banking system through sharp rises in interest rates.

3. THE EMPIRICAL METHODS

In terms of methodology, this paper implements the widely used Granger causality test and the more recent Toda and Yamamoto's (1995) non-causality test to establish the direction of causation between the two variables.

Generally, the Granger causality models are as following:

$$\Delta GDP_t = \alpha_1 + \sum_{i=1}^{k} \beta_i \Delta GDP_{t-i} + \sum_{i=1}^{k} \phi_i \Delta FPI_{t-i} + Dcrisis + \upsilon_t \quad \ldots \quad \ldots \quad (1)$$

$$\Delta FPI_t = \alpha_2 + \sum_{i=1}^{k} \theta_i \Delta GDP_{t-i} + \sum_{i=1}^{k} \varphi_i \Delta FPI_{t-i} + Dcrisis + \upsilon_t \quad \ldots \quad \ldots \quad (2)$$

where GDP and FPI are real gross domestic product growth and Foreign Portfolio Investment inflow, respectively, *Dcrisis* is dummy variable for the 1997 financial crisis (0 = before 1997 and 1=1997 and after 1997), Δ is first-difference operator and *k* is the optimal lag length. The focus of analysis is basically on FPI inflow as it is perceived to be the one factor that contributes to the growth of the economy as compared to FPI outflow which is highly volatile. The test amounts to testing the significance of null hypotheses $\phi_i = 0$ and $\theta_i = 0$. To account for the effects of the 1997 Asian financial crisis on the relationship between FPI and GDP, we include the crisis dummy into the model.

Besides the Granger causality test, we also employ the augmented level VAR approach suggested by Toda and Yamamoto (1995) to determine the causal nexus between the variables. Unlike the Granger test, the Toda-Yamamoto (T&Y) approach to causality does not require *a priori* knowledge of the variables' cointegration properties. Econometrically, it circumvents the problem of pre-testing bias associated with the Granger test. So long as the order of integration of the process does not exceed the true lag length of the model, the approach is applicable in the absence of cointegration and/or of the stability and rank conditions [Toda and Yamamoto (1995)]. As for Toda and Yamamoto's (1995) non-causality test, the following specifications are estimated:

$$GDP_t = \alpha_1 + \sum_{i=1}^{k+d\max} \beta_i GDP_{t-i} + \sum_{i=1}^{k+d-\max} \phi_i^* FPI_{t-i} + Dcrisis + \upsilon_t \quad \ldots \quad \ldots \quad (3)$$

$$FPI_t = \alpha_2 + \sum_{i=1}^{k+d-\max} \theta_i^* GDP_{t-i} + \sum_{i=1}^{k+d-\max} \varphi_i FPI_{t-i} + Dcrisis + \upsilon_t \quad \ldots \quad \ldots \quad (4)$$

where *d-max* is the maximal order of integration suspected in the system. The null hypotheses that $\phi_i = 0$ and $\theta_i = 0$ are tested based on a modified Wald test statistic for parameter restrictions, which is shown to be asymptomatically chi-square distributed. The null hypothesis set for Equation (3) is $\phi_i^* = 0 \forall_i \le k$ and for Equation (4) is $\theta_i^* = 0 \forall_i \le k$. From Equation (3), FPI "Granger-causes" GDP if its null hypothesis is rejected and from Equation (4), GDP "Granger-causes" FPI if its null hypothesis is

rejected. Unidirectional causality will occur between two variables if either null hypothesis of Equations (3) or (4) is rejected. Bidirectional causality existed if both null hypotheses are rejected and no causality existed if neither null hypothesis of Equation (3) nor Equation (4) is rejected.

Secondly, similar methods of Granger causality and Toda and Yamamoto's non-causality tests are applied on variables of growth and volatility of FPI to observe the relationship between the two variables as it is hypothesised that volatility/instability of FPI might impact the economic growth of the country. The variable of FPI volatility is developed by inspecting first the possibility of the existence of Autoregressive Conditional Heteroskedasticity (ARCH) effect on residuals of the Autoregressive Moving Average (ARMA) model of FPI. If there is ARCH effect on the residuals, the volatility of FPI is developed from residuals of the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model. Otherwise, the volatility of FPI is developed from residuals of the ARMA model itself.

Furthermore, we adopt an innovation accounting by simulating variance decompositions (VDC) and impulse response functions (IRF) for further inferences. VDC and IRF serve as tools for evaluating the dynamic interactions and strength of causal relations among variables in the system. The VDC indicate the percentages of a variable's forecast error variance attributable to its own innovations and innovations in other variables. Thus, from the VDC, we can measure the relative importance of FPI fluctuation in accounting for the variations in real GDP. Moreover, the IRF trace the directional responses of a variable to a one standard deviation shock of another variable. This means that we can observe the direction, magnitude and persistence of economic growth to variation in the FPI, not vice versa.

4. EMPIRICAL FINDINGS

4.1. Data Preliminary

Both the series examined in this study, namely real GDP and Foreign Portfolio Investment inflow, are gathered from Bank Negara Malaysia's *Quarterly Bulletin* and International Monetary Fund's *IMF Financial Statistics* of various issues. The sample range is from 1991 to 2006 of quarterly data. The raw data obtained for both variables are in RM billion and the base year for real GDP is 1987. All variables are expressed in natural logarithm.

4.2. Results

As a preliminary step, we first subject each variable to Augmented Dickey Fuller (ADF) and Phillip-Perron (P-P) unit root tests. The results of the tests are displayed on Table 1. The results generally suggest that both real GDP (ln GDP) and Foreign Portfolio Investment (ln FPI) are integrated of order one as the null hypothesis that the series are not stationary is accepted at level but rejected at first difference. In other words, the variables are stationary at first difference or I(1).

Table 1

Unit Root Test

Variable	ADF Test Statistic (with Trend and Intercept)		P-P Test Statistic (with Trend and Intercept)	
	Level	First Difference	Level	First Difference
L FPI (Foreign Portfolio Investment Inflow)	–2.46	–8.84***	–2.50	–8.81***
L GDP (Real GDP)	–2.39	–3.66**	–3.19*	–9.42***
Vol_L FPI (Volatility of FPI)	–8.65***		–9.38***	

Note: ***, ** and * denote significance at 1 percent, 5 percent and 10 percent level, respectively.

The next step is to select the optimum lag length (*k*) which will be used in the Granger causality model (Equation 1) for real GDP and FPI. By saving residuals of VAR model (repeatedly starting from VAR with lag 2) and checking the correlogram of its residuals (to avoid the problem of autocorrelation), the optimum lag length is selected. Using this method, the results suggest that lag 5 is the optimum lag for both real GDP and FPI.

The Granger causality test is then conducted on the two variables using the optimum lag 5, without and with crisis dummy included in the model. The significance of using crisis dummy in the model is that it might smooth out the short-term effect of volatility and reinforce the long-term effects of GDP. Both tests, with and without crisis dummy, provide almost similar inferences. (Results with crisis dummy are shown in Table 2). The results indicate the existence of causality running from GDP to FPI but not from FPI to GDP. This implies that the change in the Malaysian economic growth causes the change in FPI. The results are highly supported by Toda and Yamamoto non-causality test using lag 6 (i.e. *k +d-max)*. As displayed in Table 2, Toda and Yamamoto's null-hypothesis of GDP not causing FPI is rejected at the 1 percent significance level which also implies that the causality of two variables is running from GDP to FPI instead of FPI to GDP.

Table 2

Results for Causality Tests

Null Hypothesis	Test Statistic (χ^2)	p-value
Granger Causality Test, with Optimum Lag (k)= 5		
FPI not Causes GDP	6.055	0.300
GDP not Causes FPI	15.573	0.008
Toda and Yamamoto Non-causality Test, with k + d-max= 6		
FPI not Causes GDP	3.552	0.615
GDP not Causes FPI	16.463	0.006

In considering that the volatility of FPI could probably impact economic performance of the country, the variable of volatility of FPI is developed from residuals of suitable ARIMA or GARCH model for FPI. By inspecting correlogram of change in log FPI (d(ln FPI)), the ARIMA(2,1,2) model is selected and it is also found that this model does not have problem of ARCH effect in residuals. Thus, we treat the model as a suitable model of FPI rather than using the GARCH model. By saving the residuals of ARIMA(2,1,2) model of FPI, the volatility FPI is developed and it is used for further test of unit root and causality test. The results of unit root ADF and P-P tests are shown in the last row of Table 1. As expected, the variable is stationary at level or I(0).

Since the order of integration of FPI volatility and real GDP is not similar, i.e. volatility of FPI is I(0) and real GDP is I(1), the only suitable causality test to both variables is Toda and Yamamoto non-causality test as this approach does not impose restriction on order of integration and cointegration. Results of Toda and Yamamoto non-causality test of both variables are displayed in Table 3. Obviously, null hypothesis of FPI volatility not causing GDP is accepted and the null hypothesis that GDP causes volatility of FPI is rejected at only 10 percent level of significance. The results firmly indicate that neither economic performance of the country is affected by the volatility of FPI and nor economic growth affects volatility of FPI.

In general, the study found that FPI of the country is neither a curse nor a blessing for the economy since we found very weak evidence that FPI flows or its volatility cause economic growth. Rather, the study finds strong evidence that the economic performance is vital in attracting FPI inflow as the causality is running from GDP to FPI inflow.

Table 3

Results Causality Test, GDP and Volatility FPI

Toda and Yamamoto Non-causality Test, with k + d-max= 6		
Null Hypothesis	Test Statistic (χ^2)	p-value
Volatility FPI not Causes GDP	3.832	0.699
GDP not Causes Volatility FPI	11.279	0.080

For further inferences, we compute variance decompositions and impulse response functions from estimated VAR. The results of impulse response functions (IRF) and variance decomposition (VDC) of variables GDP and FPI are displayed on Figure 3 and Table 4, respectively. From Figure 3, the IRF shows that FPI does react significantly to real GDP innovation for the first 2 quarters before it subsides to zero. Obviously, the positive response of FPI to GDP in the first 2 quarters implies that economic growth is important in attracting high flow of FPI to the country. On the other hand, response of real GDP to FPI seems insignificant.

Fig. 3. Impulse Response Functions of GDP and FPI

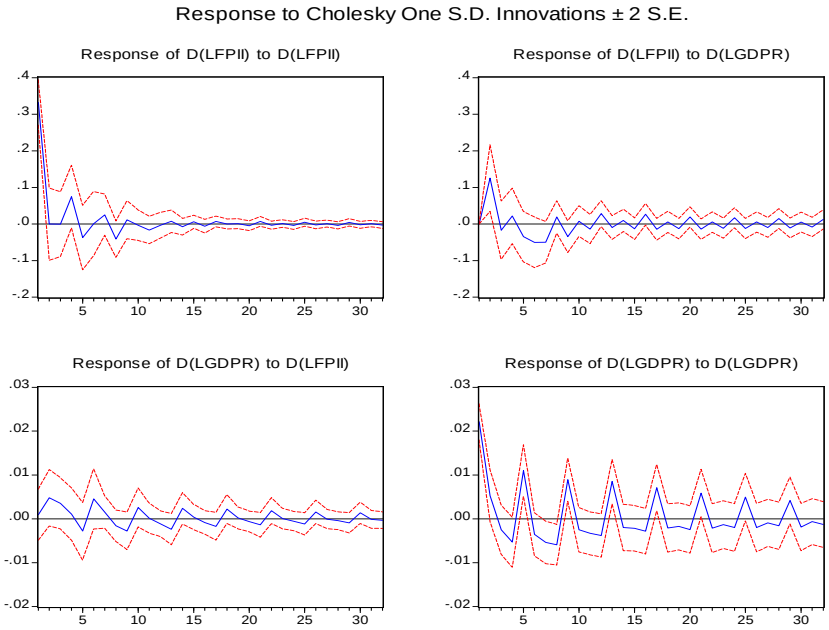


Table 4

Variance Decompositions of GDP and FPI

Period (QTR)	S.E.	D(LFPII)	D(LGDPR)
Variance Decomposition of D(LFPII)			
3	0.356	87.309	12.691
6	0.371	85.294	14.706
9	0.380	83.170	16.830
12	0.381	82.601	17.399
15	0.382	82.417	17.583
18	0.384	81.895	18.105
21	0.385	81.505	18.495
24	0.385	81.259	18.741
27	0.386	81.120	18.880
30	0.386	80.928	19.072
Variance Decomposition of D(LGDPR)			
3	0.024	6.495	93.505
6	0.027	8.792	91.208
9	0.030	8.653	91.347
12	0.031	9.139	90.861
15	0.032	9.439	90.561
18	0.033	9.605	90.395
21	0.034	9.426	90.574
24	0.034	9.633	90.367
27	0.035	9.685	90.315
30	0.035	9.709	90.290

As discussed earlier, the variance decomposition is an alternative method to IRF for examining the effects of shocks on the dependent variables. It determines how much of the forecast error variance for any variable in a system is explained by innovations to each explanatory variable, over a series of time horizons. Usually, it is the shocks that explain most of the error variance, although they will also affect other variables in the system. From Table 4, the VDC substantiate the significant role played by real GDP in accounting for fluctuations in Malaysian FPI. At one year horizon, the fraction of Malaysian FPI forecast error variance attributable to variation in real GDP is only about 12 percent. But then it further increases to almost 20 percent in 8 years (32 quarters). On the other hand, the percentage of real GDP forecast variance explained by innovation in FPI is very small which is less than 10 percent though at a longer time horizon. Thus, the VDC results also highly support the importance of growth to FPI in Malaysia rather than the other way around.

Further investigation is done using IRF and VDC on variables of real GDP and volatility of FPI. Figure 4 and Table 5 displayed both results, respectively. From Figure 4, it shows that volatility of FPI also reacts significantly to real GDP innovation for the first 2 quarters before it subsides to zero. Positive response of volatility of FPI to GDP in the first 2 quarters indicates the importance of economic growth in affecting volatility of FPI in the country. However, similar to previous results, the response of real GDP to volatility of FPI seems insignificant. The output of investigation is further strengthened by results from VDC. In Table 5, VDC confirms the significant role played by real GDP in accounting for fluctuations in volatility of FPI. The fraction of Malaysian volatility of FPI forecast error variance attributable to variation in real GDP is increasing from almost 13 percent in first quarter to almost 19 percent in 32 quarters. But the percentage of real GDP forecast variance explained by innovation in volatility of FPI is very small with only around 11 percent at a longer time horizon. Therefore, the VDC results highly support the importance of growth not only to FPI but also the volatility of FPI. Again, the impact of FPI volatility on growth is found to be insignificant.

Fig. 4. Impulse Response Functions, GDP and Volatility FPI

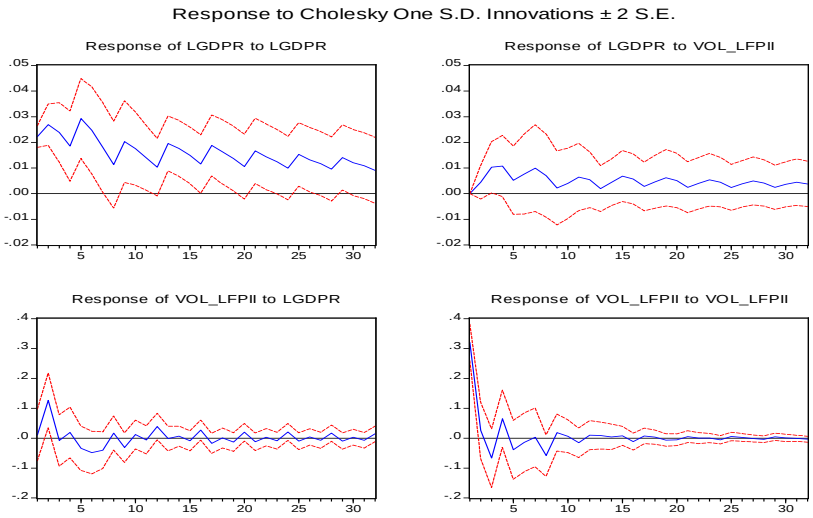


Table 5

Variance Decompositions of GDP and Volatility of FPI

Variance Decomposition of LGDPR			
Period (Quarter)	S.E.	LGDPR	VOL_LFPII
3	0.044	92.027	7.973
6	0.063	90.000	9.999
9	0.070	88.527	11.473
12	0.075	88.109	11.891
15	0.081	88.571	11.428
18	0.086	88.800	11.200
21	0.090	88.661	11.339
24	0.093	88.450	11.549
27	0.096	88.588	11.412
30	0.098	88.681	11.319
Variance Decomposition of VOL_LFPII			
3	0.352	12.709	87.291
6	0.366	14.477	85.523
9	0.374	15.939	84.061
12	0.377	16.874	83.125
15	0.378	16.931	83.069
18	0.379	17.516	82.484
21	0.380	17.913	82.087
24	0.381	18.205	81.795
27	0.381	18.300	81.703
30	0.382	18.513	81.487

5. POLICY IMPLICATIONS AND CONCLUSIONS

This study analyses the relationship between FPI inflow and economic growth in the Malaysian case. In particular, it attempts to determine the direction of causality between FPI inflow and economic growth and explores empirical evidence as to whether FPI inflow or its volatility has an impact on Malaysia's economic performance or otherwise.

The study finds that economic growth causes the FPI inflow but not its volatility. However, neither the FPI nor its volatility causes economic growth. Thus, the findings of this study suggest that FPI or its volatility is not a crucial factor in determining the economic performance of Malaysia. Rather, the study finds that economic growth is highly significant in determining the flows of FPI. Interestingly, the 1997 government policy of regulating FPI outflows does not appear to have dampened the "causality" relationship between GDP and FPI inflow. Theoretically, these inferences indicate that regulation of outflows should be a disincentive for inflows; but if regulation sustains GDP then the growth effect would outweigh the disincentive effect. The results are consistent and robust based on the battery of tests undertaken in this study.

It is an important caveat that the findings of this study are confined by the empirical restrictions resulting from the nature of the data. In particular, the selection of the optimum lag length of 5 quarters is necessitated by the statistical need to avoid the serial correlation in the residuals, as mentioned in the methodology section. However, it is important to note that such a relatively long lag of 15 months could result in the dominance of the GDP variable in causing the FPI as suggested by the Granger causality test. In other words, the long lag dictated by the optimum lag selection procedure might smooth out the short-run effects of FPI on the GDP.

As such, it can be anticipated that when the lag is reduced to shorter lags, the results could change in such a way that causality might exist from FPI to GDP, a finding which is consistent with the expectation that the effects of FPI volatility on GDP are likely to be felt relatively quick, in a time span of shorter than 5 quarters. However, the shorter lag used in the VAR model suffers from the problem of serial correlation in residuals and the number of lags used is also not supported by the lag length criteria such as LR (sequential modified LR test) statistic, FPE (Final prediction error), AIC (Akaike information criterion), SC (Schwarz information criterion) and HQ (Hannan-Quinn information criterion). When all this taken into consideration, it is difficult to capture the short-run effects of FPI volatility on GDP.

The results of the study imply that economic performance is the major pull factor in attracting FPI into the country. This was basically due to the 1997 pro-active government policy which was successful in mitigating the possible adverse effects in the post-1997 crisis period. The evidence to show that either FPI inflow is a blessing or a curse is rather very weak. Therefore, it is necessary to ensure that the Malaysian economy remains on a healthy and sustainable growth path in order to maintain investor confidence in the economy. Indeed, the experience during the 1997 financial crisis has clearly shown that the lower FPI inflow and the massive FPI outflow resulted from the anticipation of weaker economic performance due to the crisis. Regardless of the directions of causation, it is crucial for the policy-makers to provide a conducive environment to attract FPI inflow due to its numerous advantages for the economy.

REFERENCES

Ariyoshi, A., K. Hanermeier, B. Laurens, I. Otker-Robe, J. I. Canales-Kriljenko, and A. Kirilenko (2000) Capital Controls: Country Experiences with Their Use and Liberalisation. International Monetary Fund, Washington, DC: (Occational Paper 190).

Athukorala, P. (2001) *Crisis and Recovery in Malaysia: The Role of Capital Controls*. Edward Elgar: Cheltenham.

Bank Negara Malaysia (1994) *Money and Banking in Malaysia: 35th Anniversary Edition 1959-1994*. (Fourth Edition.)

Bank Negara Malaysia (Various Issues) *Monthly Statistical Bulletin*.

Bank Negara Malaysia (2006) Financial Stability and Payment Systems Report. Kuala Lumpur.

Beck, T., A. Demirguc-Kunt, and V. Maksimovic (2005) Financial and Legal Constraints to Firm Growth: Does Size Matter? *The Journal of Finance* 60, 137–177.

Bekaert, G. and C. R. Harvey (2003) Emerging Markets Finance. *Journal of Empirical Finance* 10:1-2, 3–56.

Berger, A. N., R. DeYound, H. Genay, and G. F. Udell (2000) The Globalisation of Financial Institutions: Evidence from Cross-border Banking Performance. *Brookings-Wharton Papers on Financial Services* 3, 23–158.

Claessens, Stijn, A. Demirguc-Kunt, and Harry Huizinga (2001) How Does Foreign Entry Affect the Domestic Banking Market? *Journal of Banking and Finance* 25:5, 891–911.

Cooper, R. (1999) Should Capital Controls Be Banished? *Brooking Papers on Economic Activity* 89–25.

Demirguc-Kunt, Asli and E. Detragiache (1999) Financial Liberalisation and Financial Fragility. Proceedings of the World Bank Annual Conference on Development Economics.

Doraisami A. (2004) From Crisis to Recovery: The Motivations for and Effects of Malaysian Capital Controls. *Journal of International Development* 16:2, 241–255.

Edison, H. J. and C. M. Reinhart (2000) Capital Controls during Financial Crises: The Case of Malaysia and Thailand. Board of Governors of the Federal Reserve System. (International Finance Discussion Paper No. 662).

Enders, Walter (1995) *Applied Econometric Time Series*. New York: John Wiley & Sons, Inc.

Engle, R. F. and C. W. J. Granger (1987) Cointegration and Error Correction Regression: Estimation and Testing. *Econometrica* 55:2, 251–76.

Fane, G. (2000) *Capital Mobility, Exchange Rates and Economic Crisis*. London: Edward Elgar.

Feldman, Robert A. and Manmohan S. Kumar (1995) Emerging Equity Markets: Growth, Benefits and Policy Concerns. *The World Bank Research Observer* 10:2, 181–200.

Granger, C. W. J. (1986) Developments in the Study of Co-integrated Economic Variables. *Oxford Bulletin of Economics and Statistics* 48, 213–228.

Granger, C. W. J. (1969) Investigating Causal Relations by Econometric Models and Cross-spectral Methods. *Econometrica* 37:3, 424–438.

Hamilton, J. D. (1994). *Time Series Analysis*. Princeton: Princeton University Press.

Hartwell, C. A. (2001) The Case Agaist Capital Controls: Financial Flows, Crises and the Flipside of the Free-trade Argument. *Policy Analysis* 403, 1–20.

Henry, P. (2003) Capital-account Liberalisation, the Cost of Capital and Economic Growth. *American Economic Review* 93:2, 91–96.

Johansen, S. (1988) Statistical Analysis of Cointegration Vector. *Journal of Economics Dynamics and Control* 12, 231–254.

Johnson, S. and T. Mitton (2001) Cronyism and Capital Controls: Evidence from Malaysia. (NBER Working Paper No.W8521).

Kaminsky, G. and S. Schmukler (2001) Short- and Long-run Integration: Do Capital Controls Matter? http://www.lacea.org/meeting2001/kaminsky.pdf (Assess on 20 April 2003).

Kaminsky, G. and S. Schmukler (2002) Short-run Pain, Long-run Gain: The Effects of Financial Liberalisation. George Washington University. (Working Paper).

Kaplan, E and D. Rodrik (2000) Did Malaysian Capital Control Work? Harvard University Manuscript. December.

Kim, E. Han and V. Singal (2000) Stock Market Openings: Experience of Emerging Economies. *Journal of Business* 73, 25–66.

Knill, A. (2004) Can Foreign Portfolio Investment Bridge the Small Firm Financing Gap Around the World? University of Maryland. (Working Paper).

Krugman, P. (1998) Saving Asia: It's Time To Get Radical. *Fortune*, September 7, 74–80.

La Porta, R., F. Lopez-de-Silanes, A. Shleifer, and R.Vishny (1998) Law and Finance. *The Journal of Political Economy* 106, 1113–1155.

Laeven, L. (2003) Does Financial Liberalisation Reduce Financing Constraints? *Financial Management* 32:1, 5–34.

Levine, R. and S. Zervos (1996) Stock Market Development and Long-run Growth. *World Bank Economic Review* 10, 323–339.

Li, K., R. Morck, F. Yang, and B.Yeung (2004) Firm-Specific Variation and Openness in Emerging Markets. *Review of Economics and Statistics* (forthcoming).

Love, I. (2003) Financial Development and Financing Constraints: International Evidence from the Structural Investment Model. *Review of Financial Studies* 6, 765–791.

Lütkepohl, H. (1993) *Introduction to Multiple Time Series Analysis.* (Second Edition). Berlin: Springer-Verlag, Chapter 4.

Mishkin, Frederick S. (1997) *The Economics of Money, Banking and Financial Markets*. New York: Addison-Wesley.

Patro, D. and P. Wald (2005) Firm Characteristics and the Impact of Emerging Market Liberalisation. *Journal of Banking and Finance* 29:7, 1671–1695.

Rajan, R. and L. Zingales (1998) Financial Dependence and Growth. *American Economic Review* 88:3, 559–586.

Rodrik, D. (1998) Who Needs Capital-Account Convertibility? *Essays in International Finance No.207*. Princeton, New Jersey: Princeton University. May, 55–65.

Shinn, J. (2000) Nitwits, Barbarians, and the Convergence Cycle. Princeton University. (Working Paper).

Sula, Ozan and Thomas D. Willet (2006) Reversibility of Different Types of Capital Flows to Emerging Markets. *Munich Personal RePEc Archive*, *No. 384.*

Tamirisa, N. T. (2001) Capital Controls in Response to the Asian Crisis. In Kanitta Meesook, *et al. Malaysia: From Crisis to Recovery.* International Monetary Fund, Washington, DC. (Occasional Paper No. 207).

Toda, H. Y. and Yamamoto (1995) Statistical Inference in Vector Auto-regression with Possibly Integrated Processes. *Journal of Econometrics* 66, 225–250.

Wurgler, J. (2000) Financial Markets and the Capital Allocation. *Journal of Financial Economics* 58, 187–214.

© *The Pakistan Development Review*
48 : 2 (Summer 2009) pp. 125–140

Human Capital Spillovers, Productivity and Growth in the Manufacturing Sector of Pakistan

ABDUL HAMID and J. HANNS PICHLER

Manufacturing is an important sector of Pakistan's economy. The main focus of this paper is to analyse the major factors of value-added growth and productivity in the manufacturing sector by using Translog Production Technology over the period 1971-72 to 2004-05. The empirical findings show that the contribution of productivity and human capital is around one- third of the total value-added growth in manufacturing sector which is less than the contribution attributed to these factors in developed and many other developing countries. Conventional factors like capital and labour are still the mainstay in the value-added growth of Pakistan's manufacturing sector.

JEL classification: O1, O3, O4, O14, O15, O31
Keywords: Human Capital Spillovers, Total Factor Productivity, Absolute and Relative Shares

I. INTRODUCTION

Manufacturing sector has been playing an important role in the economy of Pakistan. In 2005-06 its contribution to GDP and employment amounted to 18 percent and 14 percent respectively. It also plays a vital role in exports whose composition over time has changed significantly from primary commodities to manufactures and semi-manufactures with their share in total exports having nearly tripled, from 28 percent in 1972-73 to 79 percent in 2004-05.[1] Development therefore of the manufacturing sector will have far reaching impact on exports, employment prospects, development of agriculture (by providing machinery and other inputs like fertilisers, etc.) and other sectors by bringing technological changes and absorbing technological spillovers from abroad.

This paper aims at measurement of contribution of factor inputs, technological change and technical efficiency to value-added growth in the manufacturing sector together with measurement of total factor productivity (TFP) change index.

The layout of the paper is as follow: a review of literature is presented in Section II. Section III discusses the methodology, variables and data sources. Discussion of empirical findings and comparisons with other relevant findings is given in Section IV. Summary and conclusions with relevant policy suggestions are presented in Section V followed by references.

Abdul Hamid <ahamid_dcma@hotmal.com> is Income Distribution Specialist in the Centre for Poverty Reduction and Social Policy Development (CPRSPD). A joint project of UNDP and Planning Commission, Government of Pakistan. J. Hanns Pichler <jhp@wu-wien.ac.at> is Professor of Economics at Vienna University of Economics and Business, Austria.

[1] *Pakistan Economic Survey 2005-06* and *Labour Force Survey 2005-06*, Government of Pakistan.

II. REVIEW OF LITERATURE

The following review is intended to provide an overview of the broad aspects of topical literature relating to the subject of this paper on a selected basis.

Abramovitz (1956) did an empirical study for the US labour market for the period 1900-1950 and concluded that almost two-third of the increase in labour productivity could not be explained by increase in factor inputs. Solow (1957), Schultz (1964), Ferguson (1965), Hulten (1973), and Kendrick (1973) reported similar results for subsequent periods.

Perelman (1995) did an analysis for eleven OECD countries for the period 1970-1987 and measured technical efficiency, technological progress and total factor productivity (TFP) growth for the manufacturing industries. According to his findings TFP growth was 1.6 percent and technological progress was 1.8 percent during the sample period. He found that the main contributor in Japan's productivity growth in manufacturing was the efficiency factor.

Coe, *et al.* (1997) used data of 77 countries over the period 1971–1990 for measuring technological change and development with spillovers on productivity and growth. They concluded that a developing country can benefit more from the technological progress and innovations occurring in the world and can boost its productivity by importing a larger variety of intermediate products and capital equipments with new technology and innovations.

Kruger (2003) measured TFP for a sample of 87 countries for the period 1960-1990. Technological progress contributed about 66 percent of TFP growth in OECD/EU/G7 economies, while the share of technical efficiency was one third of TFP.

Kumbhakar (2003) used panel data for 450 manufacturing industries in US for the period 1959–92 to measure TFP and technical change. His results show that capital productivity increased by 6.5 percent.

Romer (1986) proposed that development and growth were driven by the accumulation of knowledge. He termed knowledge as a basic form of capital with investment in knowledge and R&D leading to increasing marginal returns of factor inputs. He held that knowledge had a "natural externality" and positive spillovers within and outside the economy.[2] Romer (1990) assumed four basic factors of production in an endogenous growth model: i.e., capital, labour, human capital and an index for the level of technology. According to him, key to growth and sustained development was an adequate stock of human capital.

He and Liu (2006) measured investment-specific technological change and dynamics of skill accumulation for the US for post Second World War period 1949–2000. According to their analysis, US placed great importance on skill accumulation and on job training.[3] Investment-specific technological change and technical efficiency contributed about 62 percent to average output growth per hour over the period.

[2]Knowledge is a non-rival good as knowledge of one thing can simultaneously be used by others without additional cost.

[3]Perli and Sakellaris (1998) estimated that expenditures related to on the job training (OJT) in 1987 were about $165 billion, while total educational expenditure was about $331 billion. These numbers suggest that OJT expenditure may account for as much as half of total educational expenditure in the US.

Kim and Lee (2006) measured TFP, technological change and technical efficiency for 49 countries for the period 1965–1990. Their analysis found that East Asian countries led the world in technical efficiency and productivity growth leading to higher economic growth. For example Korea, Taiwan, Hong Kong and Japan grew at the high rates of 8.51 percent, 8.62 percent, 8.03 percent and 5.74 percent respectively during 1965 to 1990. Technological development, human capital accumulation and technical efficiency were the major contributors in their higher and continuous growth rates during the reference period. Hong Kong, Japan, Taiwan and Korea showed the highest TFP growth rates of 3.85 percent, 3.53 percent, 2.85 percent and 2.18 percent respectively during the period 1965–1990.

Robinson (1971) estimated technological change, technical efficiency and spillovers caused by human resource accumulation for 39 developing countries and found that, on average, the share of productivity in total growth was 15 percent in these countries. This is a much smaller percentage attributable to technological change, technical efficiency and human capital accumulation than that in developed countries which is over 50 percent in most of the cases.

Yanrui (1995) estimated technical efficiency for agriculture and manufacturing sectors of China. According to his estimations, technological change and efficiency contributed about 53 percent in the state industrial sector, 58 percent in the rural industrial sector, and 55 percent in agriculture in the Chinese economy.

Zheng, *et al.* (2003) measured TFP in Chinese state- owned enterprises (SOEs) for the period 1980–1994. Their findings show that technical progress contributed significantly in the TFP growth for Chinese SOEs during the reference period and its annual average growth rate was as high as 10 percent. Technical efficiency ranges between 50 to 80 percent during the reference period. TFP grew at significant rates of 3 percent to 12 percent during 1980–1989, and at 3 percent to 8 percent during 1990–1994. Education was found to play a significant role in technical efficiency.

Ruhul (2006) found that in food manufacturing sector in Bangladesh, efficiency ranged between 60 to 81 percent which could be increased by 19 to 39 percent through human capital accumulation in the form of education and on job training.

Cheema (1978) found high productivity growth rate and significant contribution in the manufacturing sector of Pakistan while Ahmed (1980) who estimated productivity growth for the period 1958–70 found low gains in labour productivity. Kemal (1981) analysed the impact of technological change and technical efficiency for the period 1959-60 to 1969-70. He found overall decreasing returns to scale. Kemal and Ahmed (1992) estimated technological change, efficiency growth and productivity for agriculture and manufacturing as well as for the whole economy of Pakistan, but their studies suffer from certain limitations due to use of various functional forms to get estimates of technical efficiency without determining which form was appropriate for which industry.

Kemal, *et al.* (2002) analysed technological change, technical efficiency and TFP for Pakistan. According to their estimates, TFP grew at a rate of 1.66 percent for the period 1964-65 to 2000-01 and its share in growth of GDP was roughly one-third during the period. TFP in the manufacturing sector showed an average growth of 3.21 percent during 1964-65 to 2000-01 and 4 percent during the sixties mainly through the process of learning by doing coupled with improved export competitiveness.

Khan (1989) measured elasticity of substitutions between inputs, technical progress and returns to scale in the manufacturing sector of Pakistan by using two-level CES production function. He calculated low elasticity between labour, capital and energy and found that the manufacturing sector was exhibiting decreasing returns to scale having experienced disembodied technical progress at the rate of 3.7 percent per annum.

Mahmood (1989) used Translog Cost Function to estimate derived demand for factors in the large-scale manufacturing sector of Pakistan. The estimations found that capital and energy were complementary, and labour, capital and energy were substitutes. The lifting of any subsidy on energy and capital would tend to reduce the energy and capital intensity and, in turn, would increase the labour-intensity in the large scale manufacturing sector of Pakistan. According to his results, adoption of such a policy could help in reducing the burden of unemployment.

Mahmood (1992) further used Translog Cost Function to estimate the effects of change in government's pricing policy and external price shocks on factors demand for the industrial sector of Pakistan. According to this study, the skills of the labour force improve with technological advancements and growth in income. He found that production and non-production workers were high substitutes in the pre-energy shock period and had become marginally stronger substitutes in the post-energy shock period.

Ali and Hamid (1996) measured technological change, technical efficiency, productivity and their impact on input demand for agriculture and manufacturing in Pakistan. They found that major contributors to value-added growth in both sectors were primarily traditional factors of production.

Tariq, *et al.* (1997) estimated factor substitution, technical efficiency and employment generation in large scale manufacturing industries of Pakistan and found that technological change was capital intensive and labour saving.

Mahmood and Siddiqui (2000) measured TFP for manufacturing in Pakistan over the period 1972 to 1997. They found that increased expenditure on R&D, growth of scientific and technical manpower and growth in knowledge and human capital had a significantly positive impact on TFP growth in manufacturing. Knowledge and human capital were found to explain 30 percent and 18 percent of the variance in TFP, respectively. They also found positive and significant impact of openness and trade liberalisation on TFP.

This review of relevant literature reveals that human capital, technological change and technical efficiency are important sources of growth in the developed countries but these factors have exhibited less importance in developing countries like Pakistan. As a result, only a few studies on human capital accumulation, technological progress and technical efficiency are available especially on Pakistan, and those few also suffer from certain analytical limitations using e.g., Hicks neutral technological change assuming that technological change is happening at a constant rate. In the present research, technological change, technical efficiency, and productivity growth are measured for the manufacturing sector of Pakistan. Besides this, the study also endeavours to measure the major determinants of growth and productivity and the absolute and relative shares of these determinants of value-added growth and TFP in the manufacturing sector. Empirical analysis with international comparisons will be made in this background with related policy implications and conclusions.

III. METHODOLOGY

The following factors are assumed to be the major contributors to value-added growth in manufacturing:

$$Y = f(A, L, K, H) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Where

Y = Value-added growth in manufacturing.
L = Labour employed in manufacturing.
K = Capital stock in manufacturing.
A = Level of technology.
H = Human resources in manufacturing.[4]

Labour and capital have since long been considered as among the most important factors of production in the literature. The more recent studies like Romer (1986, 1990), He and Liu (2006) and Yanuri (2006), etc., have also used the level of technology and human capital as important factors in the analysis of total factor productivity. This paper also assumes both of these factors as key contributors to value-added growth in manufacturing along with traditional factors of labour and capital. In order to measure the major factors contributing to value-added growth, technological change and technical efficiency (which in-builds overtime due to human capital formation), the Translog production function for labour, capital, human capital and technology can be written as:

$$\begin{aligned} ln\, Y_{it} = {} & \alpha_o + \lambda t + \alpha_k\, ln\, K_{it} + \alpha_L\, ln\, L_{it} + \alpha_H\, ln\, H_{it} + (1/2)\, \alpha_{kk}\, (ln\, K_{it})^2 + (1/2)\, \alpha_{LL} \\ & (ln\, L_{it})^2 + (1/2)\, \alpha_{HH} (ln\, H_{it})^2 + \alpha_{KL}\, (ln\, K_{it}\, ln\, L_{it}) + \alpha_{KH}\, (ln\, K_{it}\, ln\, H_{it}) + \alpha_{LH} \\ & (ln\, L_{it}\, ln\, H_{it}) + u_{it} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad .. \quad (2) \end{aligned}$$

The following homogeneity constraints are implied in the Translog production function:

$$(\alpha_{LK} = \alpha_{KL}, \alpha_{HK} = \alpha_{KH}, \alpha_{HL} = \alpha_{LH})$$

$$\begin{aligned} \textstyle\sum(\alpha_K, \alpha_L, \alpha_H) &= 1 \\ \alpha_{KK} + \alpha_{KL} + \alpha_{KH} &= 0 \\ \alpha_{KL} + \alpha_{LL} + \alpha_{LH} &= 0 \\ \alpha_{KH} + \alpha_{LH} + \alpha_{HH} &= 0 \end{aligned}$$

Subject to these homogeneity constraints, the Translog production function will be estimated in conjunction with a cost share function with cross-equation restrictions imposed, a method suggested by Berndt and Christensen (1973). Labour, capital and human capital cost share equations are derived as:

$$CS_L = \partial lnY/\partial lnL = \alpha_L + \alpha_{LL}\, ln\, L + \alpha_{LK}\, ln\, K + \alpha_{LH}\, ln\, H + u_{it} \quad \ldots \quad \ldots \quad (3)$$

$$CS_K = \partial lnY/\partial lnK = \alpha_K + \alpha_{KK}\, ln\, K + \alpha_{KL}\, ln\, L + \alpha_{KH}\, ln\, H + u_{it} \quad \ldots \quad \ldots \quad (4)$$

$$CS_H = \partial lnY/\partial lnH = \alpha_H + \alpha_{HH}\, ln\, H + \alpha_{HL}\, ln\, L + \alpha_{HK}\, ln\, K + u_{it} \quad \ldots \quad \ldots \quad (5)$$

[4]Human resource development activities like education, professional and vocational training, R&D activities etc.

Where

CS_L, CS_K, CS_H are the labour, capital and human capital shares of total cost, respectively.[5]

The cost share equations will be estimated by applying "Seemingly Unrelated Regressions" [Zellner (1962)]. The Translog production function can also be estimated by using a Stochastic Frontier Approach (SFA), adopting a more flexible approach for restriction conditions.[6]

Following Baltagi and Griffin (1988) and Kumbhakar (2003), single output Translog cost function in the form of time trend model is written as:

$$lnC_{it} = \beta_0 + \sum_j \beta_j \, ln\, P_{jit} + \beta_y \, ln\, Y_{it} + \beta_t t + \tfrac{1}{2} \{\sum_j \sum_k \beta_{jk} \, lnP_{jit} \; lnP_{kit} + \beta_{yy} (lnY_{it})^2 + \beta_{tt} t^2 + \sum_j \beta_{jy} lnP_{jit} lnY_{it} + \sum_j \beta_{jt} lnP_{jit} t + \beta_{yt} \, lnY_{it} \, t \quad \ldots \quad \ldots \quad (6)$$

Where

$$\beta_{jk} = \beta_{kj}, \; \sum_j \beta_j = 1, \; \sum_j \beta_{jk} = 0, \; \sum_j \beta_{jy} = 0, \text{ and } \sum_j \beta_{jt} = 0$$

The first restriction is due to symmetry; the rest due to the fact that cost function is homogenous of degree one in the input prices.
where

C = total cost
Y = output
P_j = jth input price

From the Translog cost function given in Equation 9, technological change is measured as follows (technological change being defined as the percentage change in the total cost over time *ceteris paribus):*

$$-\partial \, lnC_{it} / \partial t = -[\, \beta_t + \beta_{tt} t + \sum_j \beta_{jt} \, lnP_{jit} + \beta_{yt} \, lnY_{it} \,] \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

Measurement of Total Factor Productivity (TFP) Change Index

The TFP change index is defined as the difference between rate of change of output and rate of change of inputs:

$$TFP^{\bullet} = y^{\bullet} - x^{\bullet} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

Where

$TEP^{\bullet}$ $TFP^{\bullet}$ = total factor productivity change index
$y^{\bullet}$ = rate of change of output
$x^{\bullet}$ = rate of change of inputs

[5]The coefficients of Translog function can also be estimated from Equation (2) by using OLS technique. However, there may occur multicollinearity problem (as labour and capital increase with a specific ratio which results in the existence of a relationship between two explanatory variables and this specific relationship causes multicollinearity problem). In order to overcome this problem we have estimated cost share equations by applying SURE. Parameters of variable H can be estimated from cost share of labour and cost share of capital by using equality constraints.

[6]Stochastic Frontier Approach (SFA) was introduced by Aigner, *et al.* (1977) and Meeusen and Van den Broeck (1977).

TFP growth can be estimated by subtracting the contribution of measured inputs growth from output growth.

Measurement of Absolute and Relative Contribution

The method for calculation of absolute contribution was introduced by Hicks (1979) and calculation of relative contribution by Hadjimichael, *et al.* (1995). The absolute share of any factor of production towards growth can be found by multiplying the estimated coefficient of the explanatory variable by standard deviation of the respective explanatory variable. The relative contribution for each independent variable can be measured by dividing its estimated absolute share by the standard deviation of the dependent variable. The relative share of variables will be unit free.

Data and Variables Description

The above model for the measurement of major factors contributing to value-added growth and productivity, technological change, technical efficiency and relative and absolute share of factors in the manufacturing sector of Pakistan is based on the following variables and data sources (data series covers the period from 1972-73 to 2006-07). All data is converted on 1980-81 constant market prices. Real value-added in manufacturing sector on constant market prices is used and data sources for value-added include the *Pakistan Economic Survey* (1990-91 and 2007-08) and Pakistan (1999) *50 Years of Pakistan in Statistics*: Volume I–IV. The number of employed workers in manufacturing is used as a labour input and data on the variable is taken from *Pakistan Economic Survey* (1990-91 and 2007-08) and Pakistan (1999) *50 Years of Pakistan in Statistics*: Volume I–IV. Enrolment in the secondary, higher and other categories like professional, vocational colleges, universities and other institutes as a ratio to total employed labour force in the manufacturing is used as a proxy to measure the impact of human capital[7] in the manufacturing; data sources include *Annual Education Statistics* (Various Issues); *Pakistan Statistical Years Book* (Various Issues); *Pakistan Economic Survey* (1990-91 and 2007-08); Pakistan (1999) *50 Years of Pakistan in Statistics*: Volume I-IV; *Human Development Report*, UNDP (2007) and *World Development Report* (2007).

Capital Stock

Capital stock is measured by using perpetual inventory method as per following equation:

$$K_t = I_t + (1 - \varphi)K_{t-1} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

Where

K_t = Capital Stock in current year.
K_{t-1} = Capital Stock in previous year.
I_t = Current Year Investment or Gross Fixed Capital Formation.
φ = Depreciation rate.

[7]Five years lag enrolment was used for secondary education and four years lag for enrolment in other categories like professional and vocational institutions and enrolment in universities etc.

For estimating the initial capital stock $K(0)$, the method used by Nehru and Dhareshwar (1993) and Khan (2006) is being followed. The capital stock series will be generated in the following way:

$$K_t = I_t + (1-\varphi)^t K(0) + \sum I_{t-i} (1-\varphi)^t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

Where

I = o to t–1
$K(0)$ = initial capital stock in year zero.

Nehru and Dhareshwar (1993) and Khan (2006) used a modified Harberger (1978) method to estimate $K(0)$. The value of investment for the first year is estimated by way of a linear regression equation of the log of investment against time. The estimated value of investment for the base or zero year is used to calculate $K(0)$ as per following equation:

$$K(0) = I_t / (gr + \varphi) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (11)$$

Where

gr = Compound value-added growth rate
φ = Depreciation rate

Various depreciation rates have been used in empirical studies. Here 5 percent capital depreciation rate is assumed. Several other studies used 4 percent depreciation rate e.g., Nehru and Dhareshwar (1993), Collins and Bosworth (1997), Khan (2006), etc.

IV. EMPIRICAL FINDINGS

The measurement of major determinants of value-added growth and the contribution of factor inputs, technological change and technical efficiency to value-added growth in the manufacturing sector of Pakistan is presented in this section. It also includes calculation of relative and absolute shares of factor inputs in the value-added and the measurement of total factor productivity change index (TFPI).

Translog Production Function Estimates for the Manufacturing Sector

Table 1 presents the estimated results for Translog Production Function in manufacturing. Zellener's Seemingly Unrelated Regression Equations (SURE) technique has been used to find the estimations. All the results are according to theoretical expectations. The estimated coefficient for technology is 0.02, a positive contribution towards the value-added growth in manufacturing. The estimated t-value shows that the coefficient is significant at 1 percent level of significance. The estimated coefficient for capital stock (K) is 0.65 and has a 1 percent level of significance. The estimated coefficient for labour and human capital are 0.15 and 0.20 respectively.[8] The contribution of factor inputs, technological change and technical efficiency to the value added in manufacturing is presented in Table 2. The estimated share for capital (K), Labour (L) and Human Capital (HK) are taken from Translog production function estimations presented in Table 1 and these are 0.65, 0.15 and 0.20 respectively. The weighted

[8]The value of coefficient for human capital is calculated from the constraints as explained in methodology.

Table 1

Translog Production Function Estimates for the Manufacturing Sector (1971-72 to 2000-01)

Independent Variables	Dependent Variable Value-added
Constant	3.52***
	(77.68)
Λ	0.02***
	(7.95)
ln K_{it}	0.650***
	(2.82)
ln L_{it}	0.15
	(0.84)
ln H_{it}	0.20[e]
$(\ln K_{it})^2$	0.023
	(1.18)
$(\ln L_{it})^2$	–0.0008
	(0.60)
$(\ln H_{it})^2$	0.0038[e]
lnL*lnK	–0.0055
	(0.38)
lnL*lnH	–0.0031
	(0.22)
lnK*lnH	–0.0007
	(0.04)
R^2	0.93
Adj-R^2	0.92
SER	0.005
DW- stat	1.66
N	30

Notes: Values in parenthesis are *t*-ratios. The Method of Estimation is Zellner's Seemingly .
*** Significant at 1 percent level. Unrelated Regression Technique (SURE).
** Significant at 5 percent level. e= Values of parameters derived from constraints .
* Significant at 10 percent level.

Where:
SER= Standard Error of Regression;
DW-stat= Durbin-Watson stat; N= Number of Observations;
K=Capital Stock; L= Labour Employed; H= Human Capital

Table 2

The Contribution of Factor Inputs, Technological Change and Technical Efficiency (TFP) to Value-added Growth in Manufacturing Sector (Calculated from Translog Production Function Estimates in Table 1)

Variables	Shares Estimations Based on Translog PF
Value-added Growth Rate	6.60
Labour Growth Rate	3.17
Capital Growth Rate	5.89
HK Growth Rate	5.02
Share of Capital in Value-added	0.65
Share of Labour in Value-added	0.15
Share of HK in Value-added	0.20
Weighted Capital Growth Rate	3.83
Weighted Labour Growth Rate	0.48
Weighted HK Growth Rate	1.00
Total Factor Input Growth Share in Value-added Growth	5.31
Technological and Technical Growth (TFP) Share in Value-added Growth	1.29
Major Determinants of Growth as Percentage of Value-added Growth	
Capital Contribution	58
Labour Contribution	07
HK Contribution	15
Total Factor Inputs Contribution	80
Technological Change and Technical Efficiency (TFP) Contribution	20
Total	**100**
Share of HK, Technological Change and Technical Efficiency	**35**

Source: Estimations is Table 1.

growth rates for K, L and HK are measured by multiplying average growth rates of these variables by their respective estimated coefficients in Table 1. The calculated weighted growth rates for K, L and HK are 3.83 percent, 0.48 percent and 1.00 percent respectively. The share of total factor inputs growth in value-added of manufacturing accounted for 5.31 percent. The share of technological change and technical efficiency in value-added is the difference between the average value-added growth (6.6 percent) and total factor inputs weighted growth rates (5.31 percent). This estimated TFP contribution accounted for 1.29 percent. The estimated shares as percentage of total value-added growth in manufacturing show that capital stock contributes the maximum (58 percent) while labour and human capital contributes 07 percent and 15 percent respectively. One reason for this insignificant role of human capital is that technical and

vocational training is given low priority and is not of that quality in Pakistan which enables human capital to bring new significant technological changes and can compete internationally and absorb technological spillovers from the advanced world. The total contribution of input factors accounts for 80 percent. The contribution of technological change and technical efficiency (TFP) is 20 percent and the contribution of TFP and human capital in value-added growth rate of manufacturing accounts for 35 percent.

Measurement of Absolute and Relative Contribution to Manufacturing Value-added and Calculation of TFP Change Index

The estimated results are depicted in Tables 3 and 4 respectively. The absolute shares for capital, labour and human capital are 0.398, 0.039 and 0.076 respectively. The relative shares for these explanatory variables follow the same pattern which for capital, labour and human capital are 0.621, 0.061 and 0.119 respectively. The measurement of absolute and relative shares show that value-added growth in manufacturing depends more on physical factors of production and less on human capital.

Table 3

Absolute and Relative Contributions of Major Determinants of Growth to Manufacturing Value-added

Variables	Estimated Standard Deviations	Estimated Coefficients	Absolute Contribution to Value-added	Relative Contribution to Value-added
Ln(K)	0.612	0.650	0.398	0.621
Ln(L)	0.260	0.150	0.039	0.061
Ln(H)	0.381	0.200	0.076	0.119
SD of Dependent Variable (Y)	0.641	–	–	–

Where:

Y= Value-added in Manufacturing;
K= Capital Stock in Manufacturing;
L = Labour Employed in Manufacturing;
HK= Human Capital; and
SD= Standard Deviation; Estimated co-efficients are taken from Table 1.

Table 4 presents the calculations for total factor productivity (TFP) change index in the manufacturing sector from the estimations based on Translog production function given in Table 1. Column (2) in Table 4 shows overtime rate of change of value-added in the manufacturing sector, while columns (3), (4) and (5) show overtime weighted rate of change of inputs i.e. weighted rate of change in capital, labour and human capital. The aggregated weighted rate of change of manufacturing inputs is presented in column (6). The difference between column (2) and column (6) i.e. difference between rate of change of value-added and the rate of change of aggregated weighted inputs is given in column (7) which is the overtime TFP change. The three years moving average growth counts for the sample period are measured at 0.0644, 0.0496 and 0.0147 for value-added, weighted aggregated inputs and TFP respectively. The last column in Table 4 shows the TFP Index which has changed from 100 in 1972-73 to 147.11 in 2004-05.

Table 4

Manufacturing TFP Change Index (1972-73 to 2004-05)
Based on Translog PF Estimates (3-Years Moving Average)

Year	$Y^{\bullet}$	$K^{\bullet}$	$L^{\bullet}$	$HK^{\bullet}$	Aggregated Inputs	$TFP^{\bullet}$	TFPI
1971-72							
1972-73							**100.00**
1973-74	0.0501	0.0232	0.0157	0.0041	0.0430	0.0071	**100.71**
1974-75	0.0269	0.0233	0.0422	0.0041	0.0697	–0.0428	**96.43**
1975-76	0.0125	0.0464	0.0110	0.0082	0.0656	–0.0531	**91.12**
1976-77	0.0452	0.0713	0.0117	0.0126	0.0957	–0.0504	**86.08**
1977-78	0.0675	0.0880	0.0119	0.0156	0.1154	–0.0479	**81.29**
1978-79	0.0949	0.0858	0.0079	0.0152	0.1089	–0.0140	**79.89**
1979-80	0.0970	0.0781	0.0043	0.0138	0.0963	0.0008	**79.96**
1980-81	0.1166	0.0621	0.0004	0.0110	0.0735	0.0431	**84.28**
1981-82	0.1031	0.0484	0.0009	0.0086	0.0578	0.0453	**88.81**
1982-83	0.0935	0.0410	0.0032	0.0073	0.0515	0.0420	**93.01**
1983-84	0.0769	0.0417	0.0052	0.0074	0.0543	0.0227	**95.28**
1984-85	0.0783	0.0426	0.0016	0.0075	0.0518	0.0265	**97.93**
1985-86	0.0771	0.0424	0.0087	0.0075	0.0585	0.0185	**99.78**
1986-87	0.0841	0.0340	–0.0004	0.0060	0.0396	0.0445	**104.24**
1987-88	0.0704	0.0259	0.0043	0.0046	0.0348	0.0356	**107.80**
1988-89	0.0643	0.0200	–0.0031	0.0035	0.0205	0.0438	**112.18**
1989-90	0.0516	0.0225	–0.0004	0.0040	0.0261	0.0255	**114.73**
1990-91	0.0673	0.0268	0.0008	0.0047	0.0323	0.0350	**118.23**
1991-92	0.0654	0.0355	0.0012	0.0063	0.0430	0.0225	**120.48**
1992-93	0.0637	0.0400	–0.0085	0.0071	0.0386	0.0251	**122.99**
1993-94	0.0478	0.0426	–0.0092	0.0075	0.0410	0.0068	**123.67**
1994-95	0.0461	0.0309	–0.0132	0.0055	0.0233	0.0229	**125.96**
1995-96	0.0322	0.0237	0.0149	0.0042	0.0428	–0.0106	**124.90**
1996-97	0.0143	0.0172	0.0067	0.0030	0.0269	–0.0126	**123.64**
1997-98	0.0112	0.0192	0.0071	0.0034	0.0297	–0.0185	**121.79**
1998-99	0.0128	0.0186	0.0074	0.0033	0.0293	–0.0165	**120.14**
1999-00	0.0464	0.0177	0.0114	0.0031	0.0322	0.0142	**121.56**
2000-01	0.0505	0.0148	0.0332	0.0026	0.0505	–0.0001	**121.55**
2001-02	0.0698	0.0142	0.0188	0.0025	0.0355	0.0342	**124.97**
2002-03	0.0908	0.0169	0.0219	0.0030	0.0418	0.0490	**129.87**
2003-04	0.1156	0.0194	0.0041	0.0034	0.0270	0.0887	**138.74**
2004-05	0.1151	0.0206	0.0072	0.0036	0.0314	0.0837	**147.11**
Average	**0.0644**	**0.0361**	**0.0072**	**0.0064**	**0.0496**	**0.0147**	

Notes: Y= Manufacturing Value-added; K= Capital Stock;
L= Labour Employed; HK= Human Capital;
TFP= Total Factor Productivity;
TFPI= Total Factor Productivity Index;
Where over dotes show the change over time;
Growth rates for K, L and HK are weighted growth rates;
Weights are taken from estimated Translog Production Function in Table 1.

V. SUMMARY AND CONCLUSIONS

The findings of this study show that conventional factors of production are still the mainstay for value-added growth in manufacturing, contributing about 65 percent of the total value-added growth, while the shares of human capital, technological changes and technical efficiency were measured at 14 percent and 22 percent respectively. TFP along

with human capital was contributing around 35 percent to the total growth in the manufacturing sector. This is significant but not up to the required level as in case of developed and in some developing countries its share has been reported at over 50 percent. Based on the empirical findings, the following recommendations and conclusions may be derived:

- Human capital should be given top priority by allocating more resources to education, training, health and to other measures along with physical factors so that human capital can properly be used for enhancing growth of the economy.
- Education policies should be devised according to the requirement of the economy and technical, vocational and professional education must be given top priority as the manufacturing sector has very high need for technical and vocational labour force.
- As openness of the economy is important for raising value-added growth and attracting more technological innovations and spillovers, there is need to search for new markets for Pakistani products through international publicity and interaction with other countries, especially with less developed and neighbouring countries.

REFERENCES

Abramovitz, Modrd (1956) Resource and Output Trends in the United States since 1870. *American Economic Review* 46:2, 5–23.

Aghion, P. and Peter Howitt (1992) A Model of Growth through Creative Destruction. *Econometrica* 60:2, 323–351.

Ahmed, M. A. (1980) Factors Which Hinder or Help Productivity Improvements in Asian Region. Country Paper for Pakistan. Asian Productivity Organisation, Tokyo.

Aigner, A., C. A. K. Lovell, and P. Schmidt (1977) Formulation and Estimation of Stochastic Frontier Production Function Models. *Journal of Econometrics* 86, 21–37.

Ali, K. and Abdul Hamid (1996) Technical Change, Technical Efficiency, and Their Impact on Input Demand in the Agricultural and Manufacturing Sectors of Pakistan. *The Pakistan Development Review* 35:3, 215–228.

Baltagi, B. H. and J. M. Griffin (1988) A General Index of Technical Change. *Journal of Political Economy* 96, 20–41.

Batra, Geeta and Hong Tan (2003) SME Technical Efficiency and its Correlates: Cross-National Evidence and Policy Implications. World Bank Institute (Working Paper).

Berndt, E. R. and L. R. Christensen (1973) The Translog Function and the Substitution of Equipment, Structures, and Labour in US Manufacturing 1929-68. *Journal of Econometrics* 1, 81–114.

Cheema, Aftab Ahmad (1978) Productivity Trends in the Manufacturing Industries. *The Pakistan Development Review* 17:1, 55–65.

Coe, D., E. Helpman, and A. Hoffmeister (1997) North-South R&D Spillovers. *Economic Journal* 107, 134–149.

Collins, S. and B. P. Bosworth (1997) Economic Growth in South Asia: Accumulation Versus Assimilation. *Brookings Papers on Economic Activity* 2, 135–203.

Ferguson, C. (1965) Time Series Production Functions and Technological Progress in American Manufacturing Industry. *Journal of Political Economy* 73:2, 135–47.

Grossman, G. and E. Helpman (1991) Quality Ladders in the Theory of Growth. *Review of Economic Studies* 58, 43–61.

Hadjimichael, M. T., D. Ghura, M. Muhleisen, R. Nord, and E. M. Ucer (1995) Sub-Saharan Africa Growth, Savings and Investment, 1986-93. Washington, DC. International Monetary Fund.

Harberger, A. (1978) Perspectives on Capital and Technology in Less Developed Countries. In M. Artis and A. Nobay (eds.) *Contemporary Economic Analysis*. London: Croom Helm.

He, Hui and Zheng Liu (2006) Investment-Specific Technical Change and the Dynamics of Skill Accumulation and Wage Inequality. University of Minnesota and Emory University, February.

Hicks, N. L. (1979) Growth vs. Basic Needs: Is there a Trade-off? *World Development* 7, 985–994.

Hulten, C. R. (1973) The Measurement of Total Factor Productivity in United States Manufacturing: 1948-66. PhD Dissertation, University of California, Berkeley.

Keller, Wolfgang and Stephen R. Yeaple (2003) Multinational Enterprises, Intentional Trade and Productivity Growth: Firm Level Evidence from the United States. Brown University. (Working Paper).

Kemal, A. R. (1981) Substitution Elasticities in the Large Scale Manufacturing Industries of Pakistan. *The Pakistan Development Review* 20:1, 1–36.

Kemal, A. R. (1993) Sources of Growth in Pakistan. Report on Economic and Social Well-being for the Eighth Five Year Plan. Islamabad, Pakistan Institute of Development Economics.

Kemal, A. R. and Islam Ahmed (1992) Report of the Sub-Committee on Sources of Growth in Pakistan, Islamabad. Pakistan Institute of Development Economics, Islamabad, Pakistan.

Kemal, A. R., Musleh ud Din, and Usman Qadir (2002) Global Research Project: Pakistan Country Report, Global Research Project Workshop, Dhaka.

Kendrick, John W. (1973) Postwar Productivity Trends in United States: 1948-66. New York: National Bureau of Economic Research.

Khan, Ashfaque H. (1989) The Two-level CES Production Function for the Manufacturing Sector of Pakistan. *The Pakistan Development Review* 28: 1, 1–12.

Khan, Safdar Ullah (2006) Macro Determinants of Total Factor Productivity in Pakistan. State Bank of Pakistan. (Working Papers, February, No. 10.)

Kim, Sangho and Young Hoon Lee (2006) The Productivity Debate of East-Asia Revisited: A Stochastic Frontier Approach. *Applied Economics* 38, 1697–1706.

Kruger, Jens J. (2003) The Global Trends of Total Factor Productivity: Evidence from the Nonparametric Malmquist Index Approach. *Oxford Economic Papers* 55, 265–286.

Kumbhakar, Subal C. (2003) Factor Productivity and Technical Change. *Applied Economics Letters* 10, 291–297.

Mahmood, Z. (1989) Derived Demand for Factors in the Large-scale Manufacturing Sector of Pakistan. *The Pakistan Development Review* 28: 4, 731–742.

Mahmood, Z. (1992) Factor Price Shocks, Factor Substitution and Their Implications for Policy. *International Economic Journal* 6: 4, 63–73.

Mahmood, Z. and Rehana Siddiqui (2000) State of Technology and Productivity in Pakistan's Manufacturing Industries: Some Strategic Directions to Build Technological Competence. *The Pakistan Development Review* 39:1, 1–21.

Meeusen, W. and J. Van Den Broeck (1997) Efficiency Estimation from Cobb-Douglas Production Function with Composed Error. *International Economic Review* 18, 435–444.

Nehru, V. and A. Dhareshwar (1993) A New Database on Physical Capital Stock: Source, Methodology and Result. *Revista De Analisis Economico* 8, 37–59.

Nikaido, Yuko (2004) Technical Efficiency of Small Scale Industry Application of Stochastic Production Frontier Model. *Economic and Political Weekly* February, 7.

Pakistan, Government of (1999) *50 Years of Pakistan in Statistics*. Volume I-IV. Federal Bureau of Statistics, Islamabad.

Pakistan, Government of (Various Issues) *Pakistan Education Statistics*. Academy of Education Planning and Management, Ministry of Education, Islamabad.

Pakistan, Government of (Various Issues) *Census of Manufacturing Industries*. Statistics Division, Federal Bureau of Statistics.

Pakistan, Government of (Various Issues) *Labour Force Survey*. Statistics Division, Federal Bureau of Statistics.

Pakistan, Government of (Various Issues) *Pakistan Economic Survey*. Finance Division.

Pakistan, Government of (Various Issues) *Pakistan Statistical Year Book*. Statistics Division, Federal Bureau of Statistics.

Perelman, S. (1995) R&D, Technological Progress and Efficiency Change in Industrial Activities. *Review of Income and Wealth* 41, 349–366.

Perli, R. and P. Sakellaris (1998) Human Capital Formation and Business Cycle Persistence. *Journal of Monetary Economics* 42, 67–92.

Rattso, J. and H. Stokke (2003) Learning by Doing and Domestic and Foreign Technology Spillovers in Thailand: Some Empirical Evidence. *Nordic Journal of Political Economy* 29:1, 47–66.

Robinson, Sherman (1971) Sources of Growth in Less Developed Countries: A Cross-Section Study. *Quarterly Journal of Economics* 85:3, 391–408.

Romer, P. M. (1990) Endogenous Technical Change. *Journal of Political Economy* 98, S71–S102.

Romer, P. (1986) Increasing Returns and Long-run Growth. *Journal of Political Economy* 94, 1002–1037.

Ruhul, A. Salim (2006) Measuring Productive Efficiency Incorporating Firms' Heterogeneity: An Empirical Analysis. *Journal of Economic Development* 31:1, 135–147.

Schultz, T. W. (1962) Reflections on Investment in Man. *Journal of Political Economy* 70, 1–8.

Schultz, T. W. (1964) *Transforming Traditional Agriculture*. New Haven: Yale University Press.

Solow, R. M. (1957) Technical Change and Aggregate Production Function. *Review of Economics and Statistics* 39:3, 312–320.

State Bank of Pakistan (Various Issues) *Annual Reports*. Karachi: State Bank of Pakistan.

Tariq, S., Karamat Ali, and Abdul Hamid (1997) Factor Substitution, Technical Efficiency and Employment Generation Prospects in the Large Scale Manufacturing Industries of Pakistan. *Journal of Research (Hum.)* 14, 141–152.

Taymaz, E. and Bulin Saatci (1997) Technical Change and Efficiency in Turkish Manufacturing Industries. *Journal of Productivity Analysis* 8, 461–475.

UNDP (2006) *Human Development Report 2006.* New York: Oxford University Press.

World Bank (Various Issues) *World Development Reports.* World Bank.

Yanrui, Wu (1995) Productivity Growth, Technological Progress, and Technical Efficiency Change in China: A Three Sector Analysis. *Journal of Comparative Economics* 21:2, 207–229.

Zellner, A. (1962) An Efficient Method of Estimation Seemingly Unrelated Regressions and Tests for Aggregation Bias. *Journal of American Statistical Association*, June.

Zheng, J. Xiaoxuan Liu and Arne Bigsten (2003) Efficiency, Technical Progress, and Best Practice in Chinese State Enterprises (1980–1994). *Journal of Comparative Economics* 31:1, 134–152.

© *The Pakistan Development Review*
48 : 2 (Summer 2009) pp. 141–153

Demand for Public Health Care in Pakistan

ATHER H. AKBARI, WIMAL RANKADUWA, and ADIQA K. KIANI

A health care demand model is estimated for each province in Pakistan to explain the outpatient visits to government hospitals over the period 1989–2006. The explanatory variables include the number of government hospitals per capita, doctors' fee per visit at a private clinic, income per capita, the average price of medicine and the number of outpatient visits per capita in the previous period. All variables are significant determinants of the demand for health care in at least one province but their signs, magnitudes and the levels of significance vary. These variations may be attributed to cultural, social and religious factors that vary across provinces. Variations in health care quality offered at public hospitals may also be a factor. These factors and improved accessibility of health care facilities should be the focus of public policy aimed at increasing the usage of public sector health care facilities in Pakistan.

JEL classification: I110, I180, O150
Keywords: Health Care, Hospitals, Human Resources, Policy, Public Health

I. INTRODUCTION

Governments in many developed and developing countries intervene in health care markets due to large positive externalities whose presence renders the provision of health care by the private sector insufficient. However, private health care provision has been growing in low and middle income countries [Aljunid (1995); Swan and Zwi (1997)]. Shorter waiting time, better access, greater confidentiality, and greater sensitivity to patients' needs by private providers are among the major reasons cited in literature [Lönnroth, Tran, Thuong, Quy, and Diwan (2001)].

The growing reliance on private sector for health services in developing countries has raised concern among some health policy analysts who view the quality of care offered by many private providers to be poor [Brugha and Zwi (1998)]. Poor people spend a greater proportion of their income on health care than do the rich, often using less qualified or totally untrained private providers. Despite this concern, and the lack of usage of public health care services, very few studies in health economics literature have focused on estimating the effects of economic and non-economic factors on demand for public health care in developing countries. Such an analysis is necessary for an appropriate policy response to rising health care usage in the private sector if the social objectives of health care policy are to be met. Rising income inequality is another reason

Ather H. Akbari <ather.akbari@smu.ca> is Professor of Economics, Saint Mary's University, Halifax, Canada. Wimal Rankaduwa <wrankaduwa@upei.ca> is Professor of Economics, University of Prince Edward Island, Canada. Adiqa K. Kiani <adiqakiani@fuuastisb.edu.pk> is Assistant Professor of Economics, Federal Urdu University of Arts, Science and Technology, Pakistan

Authors' Note: Financial support for this study was provided to the first author by the Higher Education Commission during 2008-09 under its Start-up research grant programme available to foreign faculty. We thank the anonymous reviewer for providing valuable comments on an earlier draft.

for justifying such an analysis. The present paper attempts to fill in the gap in empirical demand analysis of health care in developing countries by estimating a demand function for public health care in Pakistan. The demographic transition of Pakistani population is expected to result in a growing percentage of its elderly population [Durr-e-Nayab (2008)]. Hence, demand for health care is expected to grow in this country in the next few decades which provides further impetus for studying the demand for health care in Pakistan.

Pakistan has a population of about 176 million people who comprise six major ethnic groups including Punjabi 44.68 percent, Pashtun (Pathan) 15.42 percent, Sindhi 14.1 percent, Sariaki 8.38 percent, Muhagirs 7.57 percent, and Balochi 3.57 percent [Central Intelligence Agency (2009)]. Punjabis and Sariakis are mostly found in the Punjab province, Sindhis and Muhajirs in Sindh, Pashtuns in Khyber Pakhtunkhwa (formerly NWFP) and Balochis in Balochistan. In addition, Khyber Pakhtunkhwa has been home to Afghan refugees for the past 30 years and about 1.7 million Afghan refugees were living there in 2009. This ethnic distribution of Pakistani population has contributed to a diverse set of cultural practices which may also reflect in the usage of health care services. Cultural, as well as religious norms, often determine if and when health care is sought by patients.[1] It is difficult to quantify the impact of cultural and religious norms in a health demand estimation. Hence, we estimate the health demand model separately for each province.[2]

The paper is organised as follows. Section II presents a brief overview of the current health care system in Pakistan. Section III presents the health demand model and discusses the data used in its estimation. Section IV presents the econometric analysis while Section V discusses its results. Section VI presents a summary, concludes the study and provides some directions for future research.

II. A BRIEF REVIEW OF PAKISTANI HEALTH CARE SYSTEM

Health care management in Pakistan is primarily the responsibility of provincial governments, except in case of federally administered territories. However, the federal government is responsible for planning and formulating national health policies. Each provincial government has established a department of health with the mandate to protect the health of its citizens by providing preventive and curative services. The provincial health departments also regulate private health care providers. Large variations are found in public sector spending on health care across provinces. Balochistan and Khyber Pakhtunkhwa spend the least share of their public expenditure on health care and in recent years, this share has declined rapidly in Balochistan [Akram and Khan (2007)]. Health care provision in each province is in a three-tiered system in which public, private and non-governmental sectors participate. Private sector serves nearly 70 percent of the

[1]Falvo (2004) points out that in some cultures seeking medical help may be considered a sign of weakness. In other cultures, women may take a medical advise from older women in the family rather than seeing a health practitioner. Varley (2002) attributes the failure of biomedical pharmaceuticals and clinical practices in its treatment of women in Northern Pakistan to social and religious norms.

[2]It is understood that due to ethnic diversity within a province, cultural practices within that province may not be homogeneous. For example, as one would expect in the provinces of Punjab and Sindh. However, in each case, there is a dominant ethnic group whose practices may largely dominate the data that we describe in a later section.

population. It is primarily a fee-for-service system and covers a range of health care provision from trained allopathic physicians to faith healers operating in the informal private sector [World Bank (1993)]. Neither private nor the government sector work within a regulatory framework and very little information is available regarding the extent of human, physical and financial resources engaged in these sectors.

According to the Pakistan Social and Living Standards Measurement Survey [PSLM (2004-05)], as many as 67.4 percent households in Pakistan consult health providers in private sector when they have health problems (see Table 1). Majority of both rural and urban households consult private health care providers which mainly include: private clinics/hospitals, chemist/medical stores, and/or pharmaceutical industry. A large number also consults homeopaths and *tabbibs*,[3] the latter being especially popular in rural areas. The highest private consultation is in the province of Sindh and the lowest in Balochistan, especially rural Balochistan.

Table 1

Health Consultations by Type of Health Provider Consulted (Percentage)

	Health Provided/ Consulted							
Region/ Province	Private/ Dispensary/ Hospitals	Public Dispensary/ Hospitals	RHC/BHU	Hakim/ Herbalist	Homoeopathic	Chemist/ Pharmacy	Saina/ Saini	Other
Urban Areas	**71.5**	**20.47**	**0.52**	**1.76**	**1.54**	**3.1**	**1.01**	**0.11**
Punjab	73.5	15.42	0.26	3.09	2.28	3.91	1.37	0.18
Sindh	78.93	17.79	0.75	0.75	0.96	0.14	0.65	0.03
Khyber Pakhtunkhwa	55.81	31.31	0.39	0.67	1.44	9.13	1.09	0.16
Balochistan	56.47	40.68	1.2	0.99	0.1	0.13	0.43	0
Rural Areas	**64.31**	**20.68**	**3.5**	**2.32**	**0.6**	**6.89**	**1.36**	**0.35**
Punjab	71.08	15.27	1.2	4.74	1.22	3.85	2.28	0.35
Sindh	76.29	18.71	3.23	0.53	0.16	0.28	0.52	0.29
Khyber Pakhtunkhwa	51.73	21.73	3.6	1.15	0.44	19.9	1.13	0.32
Balochistan	47.57	37.51	10.21	2.13	0.17	0.69	1.2	0.51
Overall	**67.4**	**20.59**	**2.22**	**2.08**	**1**	**5.26**	**1.21**	**0.24**
Punjab	72.27	15.34	0.74	3.93	1.74	3.88	1.83	0.27
Sindh	77.6	18.25	2	0.64	0.56	0.21	0.58	0.16
Khyber Pakhtunkhwa	52.92	24.53	2.66	1.01	0.73	16.75	1.12	0.28
Balochistan	50.34	38.5	7.41	1.77	0.15	0.52	0.96	0.35

Source: Federal Bureau of Statistics, PSLM (2004).

In contrast with private health care, public health care is offered at a low cost. Generally, a patient treated at a public hospital's Out Patient Department (OPD) does not pay any consultation fee but has to incur own cost when buying medicines.

Health care facilities under public sector comprise more than 10,000 health facilities ranging from Basic Health Units (BHUs) to tertiary referral centres (Table 2). In the 1990s, a BHU covered around 10,000 people, whereas the larger Rural Health Centres

[3]*Tabbibs* or *hakims*, are traditional health providers who operate under ancient Greek system of remedy relying mainly on herbal medicine. In 2006, there were about 55,000 *tabbibs* in Pakistan with 31 specialised institutions offering diploma and 3 universities offering degrees (http://www.pakistan.gov.pk/ministries/planninganddevelopment-ministry/mtdf/7-Health/7-Health.pdf).

Table 2

*Mean Values and Standard Errors of Variables in the Model (1989-2006)**

Variable	Punjab	Sindh	Khyber Pakhtunkhwa	Balochistan
VPC	0.62998	0.26145	0.35727	0.27787
	(0.27444)	(0.063070)	(0.21442)	(0.21463)
HOSPC	0.0000582	0.0000363	0.0000728	0.0002012
	(0.0000040)	(0.0000066)	(0.0000070)	(0.0000366)
DOCFE	46.637	110.87	39.785	100.98
	(14.624)	(58.050)	(6.0771)	(19.172)
INCOME	3051.4	4163.9	2945.8	3527.0
	(168.98)	(299.72)	(237.15)	(336.75)
PMED	83.939	86.593	84.462	87.046
	(32.289)	(24.380)	(26.493)	(24.507)

Notes: * Numbers in the parentheses are standard errors. VPC=Visits per capita to Out Patient Department at government hospitals, HOSPC = Number of hospitals per capita, DOCFE = Consultation fee charged by a doctor at a private clinic, INCOME = Income per capita, PMED = Medicine price.

(RHCs) covered around 30,000-45,000 people.[4] The "tehsil" headquarter hospitals cover population at sub-district level whereas the district headquarter hospitals serve an entire district.[5]

The finding that only one out of three patients uses public health care raises an important question for health policy-makers in Pakistan: should public funds not be directed towards subsidising the private sector health care rather than to public sector health care which should focus on serving the poorest of the poor?

To answer this question, it is important to understand the factors that affect demand for public sector health care.

III. ECONOMIC MODEL AND DATA USED FOR PRESENT STUDY

Most health care demand studies in developing countries have analysed the effects of various determinants of health care demand, such as user fee (or consultation fee), income, quality of health care and distance to the health care provider, on the demand for public health care. These studies are based on data obtained through surveys sponsored by international organisations such as the World Bank.[6]

In Pakistan, the PSLM is a comprehensive annual survey of households which provides indicators of health in addition to other social indicators such as education, water supply and sanitation, and household economic situation and satisfaction. Unfortunately no information on the price charged for consultation at health care facilities, which is a major variable of interest to us, is available through this or any other survey. The Federal Bureau of Statistics publishes annual data, for major cities in

[4]BHUs and RHCs comprise Primary Health Care (PHC) units.

[5]Government of Pakistan, Situation Analysis of Health in Pakistan, Ministry of Health, Islamabad, 1995.

[6]For example, Mwabu, Ainsworth, and Nyamete (1993) on rural Kenya; Akin, David, and Hazel (1995) on the Ogun state on Nigeria; Xu, *et al.* (2006) on Uganda; Asfaw, Braun, and Klasen (2004) on Ethiopia; and Ching (1995) on the Phillipines.

Pakistan, on consultation fee charged in a private health care facility that is viewed as a substitute for a public health care facility in health economics literature. Annual data on other determinants of health care demand are also available at provincial levels. So we decided to base our analysis on time series data for each province.

To estimate the demand for public health care in Pakistan, we resort to the standard demand theory. In health economics, the demand function for health care is measured at individual level as well as for the entire market.[7]

Due to data limitations, we focus on market demand for outpatient services in public hospitals. We specify the following demand function:

$$VPC_t = f(HOSPC_t, DOCFE_t, INCOME_t, PMED_t, VPC_{t-1}) \quad \ldots \quad \ldots \quad (1)$$

This model postulates that the number of outpatient visits per capita in period (VPC) at government hospitals is a function of the number of government hospitals per capita (HOSPC), doctors' fee per visit at private hospitals (DOCFE), income level per capita (INCOME), price of medicine (PMED), and the number of outpatient visits per capita in the past period (VPC_{t-1}). The subscript "t" refers to the time period.

Data on the number of patient visits were obtained from Development Statistics of each province (Various Issues) covering the period 1989-2006. These were divided by the estimated population in each province on which data were obtained from *Agricultural Statistics of Pakistan* (Various Issues). For the province of Sindh, these data were available only until 1998 and had to be extrapolated for the remaining period of our analysis. We based our extrapolation on the average share of outdoor patient visits in total (indoor and outdoor) hospital visits in the late 1990s.[8]

We include the number of hospitals per person as an independent variable as it is an indicator of the accessibility of public health care service to the patient. If a public hospital is far from the patient's place of residence, it may be inconvenient to visit that hospital as the visit may involve incurring extra transportation and time costs. For women, the inconvenience may be even more serious because due to cultural and social reasons, many have to depend on a male member of the household to accompany to the clinic. Hence, if a private clinic is nearby, a patient may decide to visit the same by paying the consultation fee, instead of travelling long distance to the public hospital where consulting a doctor is free. Therefore, we expect the number of hospitals per person to have a positive sign in our model. Data on the number of hospitals in each province were obtained from each province's Development Statistics and were divided by the estimated population in each province.

Our second independent variable is doctors' fee charged for consultation in a private clinic. A private clinic may be viewed as a substitute for the OPD in a public hospital. Hence, we expect the sign of this variable to be positive. Other studies, mentioned earlier, have found a growing use of private health care in developing countries despite the availability of public health care. This raises the issue regarding the substitutability of public and private health care systems in those countries. The sign and magnitude of this variable will help determine the role of prices in patients' choice of a

[7]In their textbook on health care economics, Folland, Goodman, and Stano (2009) discuss the application of demand theory in economics of health care.

[8]During the period 1989-1998, the share of outdoor patients in total patient visits was fairly stable, varying between 96 and 97 percent.

health care system, keeping other demand determining variables constant. Data on fee charged at private clinics were obtained from the *Statistical Bulletin* published by the Federal Bureau of Statistics (Various Issues) which provides data for major cities. Average fee reported in each province's capital city was considered.

Income also plays an important role in determining whether a patient uses private or public health care system. Due to the public perception of lower quality of care provided in public sector hospitals, and expectations of longer waiting times, one would expect public health care service to be an inferior good. Hence, our dependent variable should have a negative relationship with the income per capita variable. Data on this variable were obtained from *Household Integrated Economic Survey* (Various Issues) and are for average household income.

Another important independent variable in the model is the price of medicine. Patients have to purchase medicine in the market regardless of whether they attend OPD at a public hospital or go to a private clinic for consultation. Hence, medicine price may be viewed as a rationing tool in the use of public health care by patients in Pakistan. In fact, patients' response to changes in this variable may also be viewed as similar to how they would respond if a user fee were introduced for using OPD at the public hospital. We expect this variable to have a negative sign in the model. Data on medicine prices are averages of various major medicines reported in the *Statistical Bulletin* of the Federal Bureau of Statistics (Various Issues) and are for the capital city in each province.

The model also includes the past level of visits per capita representing the past behaviour of patients. This variable captures the effect of habit persistence in the case of patient visits to OPDs in government hospitals.

The demand model (1) is estimated in the following log-linear form:

$$Ln\,(VPC)_t = \alpha_0 + \alpha_1 Ln\,(HOSPC)_t + \alpha_2 Ln\,(DOCFE)_t + \alpha_3 Ln\,(INCOME)_t + \alpha_4 Ln\,(PMED)_t + \alpha_5 Ln\,(VPC)_{t-1} + e_t \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

The coefficients α_1, α_2, α_3, α_4 and α_5 in this formulation are the elasticities of demand with respect to the respective variables. The term *e* is the stochastic error term.

The model is estimated using the annual time series data from 1989 to 2006 separately for each of the four provinces of Pakistan. An analysis of linear long term trend in each series indicated that VPC had a positive trend in all provinces, except in Sindh for which the series displayed a negative trend. The linear trend in the HOSPC series was negative in all provinces, again with the exception of Sindh, where a positive linear trend was found in this variable. For all provinces, the INCOME and PMED series displayed positive trends while DOCFE displayed a negative trend. The PMED series displayed the strongest trend, among all variables, in all four provinces.

Mean values of the data series and the corresponding standard errors are reported for the four provinces during the period of study in Table 2. Our dependent variable, i.e., patient visits per capita to the OPD in public hospitals is significantly higher in Punjab than in any other province. The second highest value of this variable is in Khyber Pakhtunkhwa, while in the other two provinces this number is roughly the same. Among the determinants of demand, medicine price is the lowest in Punjab followed by Khyber Pakhtunkhwa. On per capita basis, Balochistan—the least populated province in Pakistan—has the highest number of hospitals. Income per capita and doctor's

consultation fee is the second highest, while medicine price is the highest, in Balochistan. Doctor's fee and income per capita are positively related across provinces. Our econometric analysis of the next Section will allow us to assess the sensitivity of the visits per capita in each province with respect to each of the demand determinants, while keeping the effect of others constant.

IV. ECONOMETRIC RESULTS

Recent research in time series analysis emphasises the need for investigating (or testing for) evidence for stationarity and co-integration among time series data prior to estimation of econometric models using them. These tests are necessary to ensure that the model estimation would not yield spurious results. Accordingly, Phillips-Perron unit root tests are applied to all of the data series used in this study. The results are reported in Table 3.

Table 3

Results of Phillips-Perron Unit Root Tests on Variables Used in the Model

Province	Variable	F-test (1) H_0: $\alpha_0 + \alpha_1 + \alpha_2 = 0$	F-test(2) H_0: $\alpha_1 + \alpha_2 = 0$	F-test(3) H_0: $\alpha_0 + \alpha_1 = 0$	t-test(1) H_0: $\alpha_1 = 0$
Punjab	Ln (VPC)	7.4167	6.0146		
	Ln (HOSPC)	4.5993	6.0348		
	Ln (DOCFE)	9.1662	4.9177		
	Ln (INCOME)	4.1485	6.0785		
	Ln (PMED)	4.3206	3.1681		
Sindh	ΔLn (VPC)			5.4312	–3.2553
	ΔLn (HOSPC)			3.7430	–2.7521
	ΔLn (DOCFE)			6.4262	–2.9592
	ΔLn (INCOME)			12.526	–4.8401
	ΔLn (PMED)			4.1253	–2.8062
Khyber Pakhtunkhwa	ΔLn (VPC)	8.0116	12.016		
	ΔLn (HOSPC)	9.8209	14.719		
	ΔLn (DOCFE)	3.8042	5.7057		
	ΔLn (INCOME)	16.922	25.383		
	ΔLn (PMED)	5.0248	7.5277		
Balochistan	ΔLn (VPC)			4.0011	–2.8180
	ΔLn (HOSPC)			4.2927	–2.9236
	ΔLn (DOCFE)			7.4273	–3.8595
	ΔLn (INCOME)			6.2744	–3.5234
	ΔLn (PMED)	5.2658	7.8978		

Notes: For variable legend, please see notes below Table 2. The equation estimated for a given variable y for t-test (1) and F-test (3) is given as:

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{j=1}^{p} \gamma \Delta y_{t-j} + e_{t-1}$$

Asymptotic critical values for the t-test and F-test at 10 percent level of significance using the above equation are –2.57 and 3.784, respectively.

The equation estimated for a given variable y for the F-test (1) and F-test (2) is:

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 t + \sum_{j=1}^{p} \gamma \Delta y_{t-j} + e_{t-1}$$

Asymptotic critical values for the F-test (1) and F-test (2) at 10 percent level of significance using the above equation are 4.03 and 5.34, respectively.

Results reported in Table 3 confirm that all of the data series used for Punjab are integrated of order zero (i.e., I(0)), and hence the estimation of the model given by the Equation (2) would not yield spurious results. Therefore, the model given by the Equation 2 is estimated for Punjab with the addition of the variable *T* that accounts for the time trend. Results of this exercise are reported in Table 4.

Table 4

Model Estimates for Punjab, Sindh, Khyber Pakhtunkhwa and Balochistan

	Model Equation 2	Model Equation 3 Error Correction Model		
Variable[a]	Punjab	Sindh	Khyber Pakhtunkhwa	Balochistan
Ln (HOSPC)	3.1599**	6.6768**	–7.5582*	2.7145**
	(5.028)	(4.754)	(–2.124)	(3.147)
Ln (DOCFE)	0.84649**	1.2633**	–6.2606**	0.40214
	(3.068)	(3.978)	(–4.292)	(0.8543)
Ln(INCOME)	0.58216*	–2.9310**	–1.3687	–0.68622
	(2.076)	–(6.069)	(–0.4610)	(–0.6806)
Ln (PMED)	–0.16337	–1.1600	–5.7969*	–1.0185
	(–1.035)	–(0.9885)	(–2.187)	(–0.8424)
Ln $(VPC)_{t-1}$	0.43679**	–0.87355**	0.61074**	1.3711**
	(2.668)	–(3.450)	(3.104)	(4.498)
e_{t-1}		–1.5119**	–1.6605**	–1.2341**
		–(4.454)	(–5.697)	(–3.358)
T	0.13343**			
	(5.704)			
Constant	21.819**	–0.01949	0.03551	0.10105
	(4.000)	(–0.8381)	(0.1541)	(0.9565)
N	17	13	16	16
Df	10	6	9	9
R2	0.99	0.90	0.83	0.67
Adj.R2	0.98	0.81	0.71	0.45
D.W.	2.1570	2.4707	1.9337	2.2351
D.H	–1.4497	–2.6429	2.3446	–1.2402

Notes: [a] The error correction model includes the error correction term e_{t-1} and the first differences of the other variables. Values reported in parentheses are the t-ratios for coefficients.

* Statistically significant at 10 percent level.

** Statistically significant at 5 percent level.

Variable legend provided under Table 2.

Results of the unit root tests indicate that many of the data series for the other three provinces are not integrated of order zero. However, the first differences of all of those series are found to be stationary (i.e., the data series are integrated of order one, I(1)). The results of the unit root tests that confirm their stationarity are also reported in Table 3. The Phillips tests of cointegration are then applied to verify evidence of a long run equilibrium relationship among these variables in each of the provinces. In the presence

of such evidence, an appropriately specified error correction model, derived from the model Equation (2), is estimated.

The error correction model specified in this study is given by the following equation:

$$\Delta Ln\,(VPC)_t = \beta_0 + \beta_1\,\Delta Ln\,(HOSPC)_t + \beta_2\,\Delta Ln\,(DOCFE)_t + \beta_3\,\Delta Ln\,(INCOME)_t + \beta_4\,\Delta Ln\,(PMED)_t + \beta_5\,\Delta Ln\,(VPC)_{t-1} + \beta_6\,e_{t-1} + v_t \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

The evidence for a long run relationship (i.e., cointegration) in terms of Phillips tests is present in the case of Sindh. Accordingly, the error correction formulation is considered the appropriate model to be estimated for that province. However, we estimated the error correction model for all of the three provinces for which all the data series were found to be integrated of order one and have reported those results in Table 4.

V. DISCUSSION OF RESULTS

Based on the results of Phillips Perron unit root tests and Phillips tests of cointegration, we estimated the model given by Equation 2 for Punjab and the model given by Equation 3 for the rest of the provinces. The results of this exercise are summarised in Table 4. The estimated coefficients are the demand elasticities with respect to explanatory variables included in the model. These explanatory variables include the number of government hospitals per capita, doctors' fee per visit at private hospitals, income level per capita, price of medicine, and the number of outpatient visits per capita.

The estimated demand elasticity with respect to the hospitals per capita (HOSPC) are greater than unity in absolute value for all the four provinces. The estimates for Punjab, Sindh and Balochistan are positive and statistically significant at the 5 percent level of significance. The estimate for Khyber Pakhtunkhwa is negative and significant at 10 percent level of significance. The negative sign for Khyber Pakhtunkhwa appears puzzling and may be partly due to a strong aversion to treatment outside of home. Greater availability of health professionals that accompanies a public hospital may create a higher demand for treatment at home, especially in case of women in Khyber Pakhtunkhwa. This interpretation however needs further investigation by a survey of preferences among patients, women in particular. The lowest elasticity value in Balochistan is perhaps also reflecting lower quality of public health care in that province where the share of public health care expenditure has declined in total public expenditures over the period covered in this study.

The estimated elasticity with respect to doctors fee (DOCFE) is statistically significant at 5 percent level of significance for all the provinces but Balochistan. The estimated elasticity value is positive in Punjab and Sindh and negative in Khyber Pakhtunkhwa, indicating that patients in the first two provinces view health services provided at OPDs in public hospitals as substitutes for services provided at private clinics, while patients in Khyber Pakhtunkhwa view them as complementary goods. The Khyber Pakhtunkhwa result could be an indication that patients in that province view public and private health care as a collective good and reduce their demand to all health care provided outside of home when consultation fee at private clinics rises. They may be seeking home care when fee charged at a private clinic increases. This explanation can only be confirmed or rejected by further research. The statistically insignificant effect of

DOCFE in Balochistan is consistent with the lowest availability of hospitals per capita in that province.

Among the four provinces, Sindh is the only province where the estimated income elasticity is found to be significant at 5 percent level of significance. In case of Punjab, the estimated income elasticity is found to be significant only at 10 percent level of significance and is positive only in that province. However, the demand for OPD services is income inelastic, as the income elasticity value is lower than unity. In Khyber Pakhtunkhwa and Balochistan, income has no statistically significant effect on the demand for public health care, i.e., demand is income inelastic in these two provinces as well. The income inelasticity of public health care in most of the provinces of Pakistan indicates that health care is generally viewed as a necessity in that country.[9] The perfect income inelasticity of demand in Khyber Pakhtunkhwa and Balochistan may be due to lower per capita income levels in these two provinces which are also home to a large number of refugees from Afghanistan. Sindh is the only province where public health care is viewed as inferior good which could be due to greater availability of private health care in that province but this needs further investigation.

The estimated elasticities with respect to price of medicine (PMED) are negative in all of the provinces, as expected, but not statistically significant at 5 percent level of significance in any of the provinces. In Khyber Pakhtunkhwa, the estimated elasticity value is the highest in magnitude and is significant at the 10 percent level of significance. Hence, patient visits are inelastic with respect to the price of medicine, particularly in the provinces of Punjab, Sindh and Balochistan.

The estimated coefficient of the lagged visits per capita which captures the effect of past behaviour is significant at 5 percent level of significance in all of the provinces. The estimate is positive for Punjab, Khyber Pakhtunkhwa and Balochistan. In these provinces, the higher the demand in the past, the higher the demand in the present. In contrast, the estimated coefficient for the province of Sindh indicates that the higher the demand in the past the lower the present demand in that province. The positive sign is an indication of repeat patient visits in three provinces, but not in Sindh.

VI. SUMMARY, CONCLUDING REMARKS AND DIRECTIONS FOR FUTURE RESEARCH

The present study provided a model of demand for health services to analyse the demand for outpatient visits to OPDs at government hospitals in the four provinces of Pakistan. The model was estimated using the annual time series data from 1989 to 2006. Based on the results of the unit root tests (Phillips Perron unit root tests) and cointegration tests (Phillips tests) performed on the data, an error correction formulation of the model is estimated for Sindh, Khyber Pakhtunkhwa and Balochistan. The explanatory variables included the number of government hospitals per capita, doctors' fee per visit at a private clinic, income per capita, the price of medicine and the number of outpatient visits per capita in the previous period.

[9]The PSLM survey of 2007-08 indicated that the percentage of respondents in Punjab who indicated their reason for not using a public hospital to be its distance from their place of residence is the highest, about 26 percent, among all four provinces [Pakistan (2009)]. If public hospitals are not evenly distributed in the province, then the positive income elasticity can be justified as poor are unable to travel long distance to a public hospital. This aspect of our result needs further research.

The estimated coefficients of any explanatory variable do not display uniformity in terms of the sign or the magnitude across the four provinces. However, all the explanatory variables can be identified as empirically significant determinants of the demand for health care at OPDs in government hospitals as the estimate for any given explanatory variable is significant at the 10 percent level of significance at least for one among the four provinces. We believe differences in the estimated elasticities across the provinces could be due to two main reasons: First, they could partly reflect the differences in the dominant culture and customs that influence the choice of patients among home care, private health care and public health care services. Indeed, Ali, Bhatti and Kuroiwa (2008) have found that cultural norms dictate women's utilisation of maternal health care facilities in the provinces of Khyber Pakhtunkhwa and Punjab. Second, these results could also be a reflection of differential quality of health care offered at public hospitals in Pakistan in different provinces. For example, the declining share of health care spending in total public spending in Balochistan could have resulted in lower quality of health care in that province than in others and is probably reflected in lower coefficient of the hospital per capita variable in that province. Available data do not allow us to identify the extent to which cultural norms and quality of health care delivery result in differential utilisation of public services across the four provinces. However, to gain more insights into the above results, one can classify the data into urban and rural regions, because rural population is usually more reliant on traditional and religious values. To assess the effects of quality differences in health care, one may construct the appropriate provincial health quality measures.

In most provinces, the demand for health care is positively related to the availability of health services, the doctors' fees at private clinics, and the past level of demand. The demand is negatively related with the price of medicine in majority of provinces. The elasticity of demand with respect to the number of hospitals per capita is the highest of all estimated elasticities. As such, the availability of services is perhaps the most significant determinant of the demand for health care in Pakistan. The negative value of this elasticity in Khyber Pakhtunkhwa is an indicator of general aversion to out-of-home care which is substituted for home care with greater availability of health professionals accompanying government hospitals. The results confirm the fact that services provided at OPDs in public hospitals and in private clinics are substitutes in most parts of Pakistan and, based on the test of significance, are viewed as inferior goods only in the province of Sindh. Income does not have an effect on public health care demand in the Khyber Pakhtunkhwa and Balochistan provinces, while it does have a positive effect in Punjab.

There are two main policy implications of this study: First, public policy should be sensitive to different economic, cultural and religious practices in each province that play their role in health care demand.[10] Second, accessibility of health care providers is an important determinant of health care demand. Hence, the lack of demand for public health care services should not be viewed as indicating patients' preference for private health care services rather the lack of availability of health care services in the public sector. According to the PSLM (2007-08), about 46 percent of patients do not use a public sector hospital in Pakistan either because it is too far away from their home or

[10]We suggest a future research should investigate the impacts of cultural and social factors in determining the demand for health care in Pakistan more directly.

because there is none available in their region. Health policy may consider opening smaller and cost-effective health care units on a larger scale in the country. By doing so, the current regressive nature of public health care expenditures in Pakistan as indicated by Akram and Khan (2007) can also be addressed.

The markets for health care in many developing countries undergo significant transformations as a result of such factors as the increase in the participation of both the public and private sectors and the improvements in the level of health education among the general public. Higher level of understanding of both demand and supply sides of these markets is essential for effective policy-making in health related sectors in these countries. The level of interest found in the empirical research on demand side studies of health markets does not match the interest in supply side studies of these markets, in developing countries in particular. The difficulties of finding quality data may have been partly responsible for the low level of interest in empirical investigations of health markets in developing countries. Pakistan is no exception in this regard. For example, focusing specifically on United Nation's Emergency Obstetric Care (UN EmOC) indicators of maternal morbidity and mortality, Ali and Kuroiwa (2007) found poor record keeping practices in the health care facilities of the Khyber Pakhtunkhwa and Punjab. Yet, the present study focuses on the demand side of the health care market using the best available data obtainable from the domestic data sources in Pakistan. To the best of our knowledge, this is the first attempt to empirically estimate demand functions for health care for four provinces of Pakistan. Our economic model is based on sound economic theory and a strong econometric analysis. In our view, the quality of data used in this study cannot be significantly different from those used in any other empirical study in Pakistan based on time series data. It is also not known to us as to what extent the quality of our data have differentially affected our results across the four provinces. A curious researcher may corroborate our results with future survey data that focus on economic determinants of health care demand in Pakistan.

REFERENCES

Akin, J., K. Guilkey David, and Denton E. Hazel (1995) Quality of Services and Demand for Health Care in Nigeria: A Multinomial Probit Estimation. *Social Science and Medicine* 1527–1537.

Akram, M. and F. Khan (2007) Health Care Services and Government Spending in Pakistan. Pakistan Institute of Development Economics, Islamabad (PIDE Working Paper 2007: 32).

Ali, M. and C. Kuroiwa (2007) Accurate Record Keeping in Referral Hospitals in Pakistan's North West Frontier Province and Punjab: A Crucial Step Needed to Improve Maternal Health. *Journal of Pakistan Medical Association* 443–446.

Ali, M., M. Bhatti, and C. Kuroiwa (2008) Challenges in Access to and Utilisation of Reproductive Health Care in Pakistan. *Journal of Ayub Medical College Abbottabad* 20:4, 3–7.

Aljunid, S. (1995) The Role of Private Medical Practitioners and their Interactions with Public Health Services in Asian Countries. *Health Policy and Planning* 10, 333–49.

Asfaw, A., Joachim Von Braun, and Stephan Klasen (2004) How Big is the Crowding-out Effect of User Fees in the Rural Areas of Ethiopia: Implications for Equity and Resources Mobilisation. *World Development* 2065–2081.

Brugha, R. and A. Zwi (1998) Improving the Quality of Private Sector Delivery of Public Health Services: Challenges and Strategies. *Health Policy and Planning* 13, 107–120.

Central Intelligence Agency (2009) *The World Factbook—Pakistan.* (https://www.cia.gov/library/publications/the-world-factbook/geos/pk.html#People, Accessed August 28-2009).

Ching, Panfila (1995) User Fees, Demand for Children's Health Care and Access Across Income Groups: The Phiiappine Case. *Social Science and Medicine,* 37–46.

Durr-e-Nayab (2008) Demographic Dividend or Demographic Threat in Pakistan. *The Pakistan Development Review* 47:1, 1–26.

Falvo, D. R. (2004) *Effective Patient Education: A Guide to Increased Compliance.* Jones and Bartlett Publishers.

Folland, S., A. Goodman, and M. Stano (2009) *Economics of Health and Health Care*. (6th Edition). Prentice Hall.

Lönnroth K, TU Tran, LM Thuong, HT Quy, and V. Diwan (2001) Can I Afford Free Treatment? Perceived Consequences of Health Care Provider Choices Among People with Tuberculosis in Ho Chi Minh City, Vietnam. *Social Science Medicine* 52, 935–48.

Mwabu, Germano, Martha Ainsworth, and Andrew Nyamete (1993) Quality of Medical Care and Choice of Medical Treatment in Kenya: An Empirical Analysis. *The Journal of Human Resources* 838–862.

Pakistan, Government of (1995) *Situation Analysis of Health in Pakistan*. Islamabad: Ministry of Health.

Pakistan, Government of (2009) *PSLM- 2004-05, 2007-08—Pakistan Social and Living Standards Management Survey*. Islamabad: Federal Bureau of Statistics.

Swan, M. and A. Zwi (1997) *Private Practitioners and Public Health: Close the Gap or Increase the Distance*. London: London School of Hygiene and Tropical Medicine.

Toor, I. A. (2001) Determinants of Health Expenditure and its Distributional Impact on Various Income Groups in Pakistan. Applied Economics Research Centre, University of Karachi. (Master of Philosophy Thesis.)

Valery, E. (2002) Biomedical Service Delivery for Women in Northern Pakistan: Ideological Contrasts and Social Resistance. Faculty of Graduate Studies, The University of British Columbia. (Master of Arts Thesis.)

World Bank (1993) *Health Sector Study Islamic Republic of Pakistan: Key Concerns and Solutions.* Washington, DC. 65–80.

Xu, Ke, D. Evans, P. Kadama, J. Nabyonga, P. Ogwal, P. Nabukhonzo, and A. Aguilar (2006) Understanding The Impact of Eliminating User Fees: Utilisation and Catastrophic Health Expenditures in Uganda. *Social Science and Medicine*, 866–876.

© *The Pakistan Development Review*
48 : 2 (Summer 2009) pp. 155–168

Price Hikes, Economic Reforms and Causality in Money, Income and Prices: Evidence from Pakistan

FAZAL HUSAIN and ABDUL RASHID

This study extends the analysis of causality by Husain and Rashid (2008) by examining the shift in the variables due to the price hikes in Pakistan in the early 1970s. We investigate the causal relations between real money and real income, between nominal money and nominal income, and between nominal money and prices using the annual data set from 1959-60 to 2003-04. Moreover, we examine the stochastic properties of the variables used in the analysis, and take care of the shifts in the series due to price hikes and liberalisation measures through dummy variables. The results indicate significant shifts in the variables during the sample period. In this context, the shift that occurred due to price hikes in the early 1970s seems to be more important to be incorporated in the analysis. The study finds the active role of money as the leading variable in changing prices without any feedback. In the earlier studies on income the feedback mechanism of money is found missing perhaps because of overlooking the shift in the macro economic variables in the early 1970s.

JEL classification: E3, E4, N3
Keywords: Money, Income, Prices, Price Hikes, Causal Relations, Pakistan

I. INTRODUCTION

Money, Income, and Prices are important macroeconomic variables which play a crucial role in an economy. In this context, the role of money in the determination of income and prices has long been debated particularly between the Keynesians and the Monetarists who hold opposite views in this regard. The Monetarists claim that money plays an active role and leads to changes in income and prices. In other words, changes in income and prices in an economy are mainly caused by the changes in money stocks. That is, the direction of causation runs from money to income and prices without any feedback. The Keynesians, on the contrary, argue that money does not play an active role in changing income and prices. In fact income plays the leading role in changing money stocks via demand for money implying that the direction of causation runs from income to money without any feedback. Similarly, changes in prices are mainly caused by structural factors.

Fazal Husain <fazal.husain1960@gmail.com> is Chief of Research at the Pakistan Institute of Development Economics, Islamabad. Abdul Rashid <ecp09ar@sheffield.ac.uk> is associated with International Islamic University, Islamabad.

Authors' Note: The authors are grateful to the referees for their useful comments.

The empirical evidence in this regard also remains inconclusive. For example, Sims (1972) examining the causal relationship between money and income in the US economy found the evidence of a uni-directional causality from money to income. Similarly, Brillembourg and Khan (1979) using a longer data set found a unidirectional causality from money to income and prices in the U.S. as claimed by the Monetarists. However, the other studies on the issue reported opposite or different results. For example, Williams, Goodhart, and Gowland (1976) found unidirectional causality from income to money in the UK economy as suggested by the Keynesians. On the other hand, Barth and Bennett (1974), and Lee and Li (1983), found the evidence of a bi-directional causality between income and money in the economies of Canada and Singapore. However, regarding money-prices causality, the evidence seems to be consistent as the results of Williams, Goodhart, and Gowland (1976) and Lee and Li (1983) are similar to that of Brillembourg and Khan (1979); that is, a unidirectional causality from money to prices.

In Pakistan too the issue has long been investigated but with different results. For example, Khan and Siddiqui (1990) found uni-directional causality from income to money and bi-directional between money and prices. On the other hand, Bengali, Khan, and Sadaqat (1999) found a bi-directional causality between money and income and uni-directional from money to prices. Abbas (1991) also found bi-directional causality between money and income in Pakistan while performing the causality test in Asian countries. Jones and Khilji (1988) while analysing causal relationship between money and prices in Pakistan found the evidence of a bi-directional causality with money supply leading. But Siddiqui (1989) found bi-directional causality between the two with prices leading. Finally, Husain and Rashid (2008) in a comprehensive investigation on the issue which covers a longer data set, uses both the real and nominal terms of money and income, and mindful of the shifts in the series due to the economic liberalisation programme, found the evidence of a unidirectional causality from income to money and from money to prices. The study does not find the role of money in increasing national income even after taking care of liberalisation measures.

This study, extending Husain and Rashid (2008), attempts an investigation of the causal relationship between money and income and between money and prices while being cognisant of another important shift in Pakistan's economic data. The price hikes in the early 1970s, generally termed as Oil Price Shocks, had significant impact not only on the economy of Pakistan but also on the economies the world over. We investigate the causal relations between real money and real income, between nominal money and nominal income, and between nominal money and prices using the data set from 1959-60 to 2003-04 with due regard to the stochastic properties of the variables used in the analysis. In addition, we take note of the two shifts, that is, the shifts due to price hikes as well as due to economic reforms together.

The rest of the paper is organised as follows. The next section discusses the data and outlines the methodology to test the stochastic properties of the variables and their interrelationship. Section III presents the descriptive statistics regarding money, income, and prices as well as the stochastic properties of these variables. Sections IV, V, and VI

examine causal relations between real money and real income, nominal money and nominal income, and nominal money and prices respectively. The final section contains the summary and conclusions.

II. DATA AND METHODOLOGY

We use annual data from 1959-60 to 2003-04 to investigate the causal relations of money with income and prices in Pakistan. The Gross National Product (GNP) at current prices and constant prices of 1980-81 are used as nominal and real income, broad measure of money (M2) and GDP Deflator with base 1980-81 are used as Money and Prices, respectively. Finally, real money is obtained by deflating M2. The principal data source is the *National Accounts of Pakistan*, prepared by the Federal Bureau of Statistics. The other data sources include *Economic Surveys* by the Finance Division and *Annual Reports* by the State Bank of Pakistan.

We start by presenting the descriptive statistics that show the basic characteristics of the variables used in the analysis. The formal investigation, however, starts with examining the stochastic properties of the variables used in the analysis. Hence, the Unit Root Test is performed on the variables to test the stationarity of the variables. In this context, the widely used Augmented Dickey Fuller (ADF) test is used. We also use Phillips-Perron (PP) tests which is robust to a wide variety of serial correlation and heteroskedasticity, where the truncation lag parameters are determined following Schwert's (1987). Next, we apply the Engle-Granger Co-integration test to explore the long run relations among the variables. Finally, the causal relationships between these variables are examined through Granger causality and/or Error Correction Models (ECM). In all cases lag lengths are decided on the basis of minimum Final Prediction Error (FPE) and Akaike Information Criteria (AIC).

The sample period, 1959-60 to 2003-04, has been subjected to various changes due to economic and political events. In this context an important event that is likely to significantly affect the variables used in the analysis is the economic liberalisation programme started in the early 1990s. Husain and Rashid (2008) taking note of the event did not find any significant change in the role of money in the causality analysis. We extend their analysis by referring to another event that significantly affected the macro variables in Pakistan in the early 1970s i.e., the price hikes that in fact affected the economy significantly around the world. Moreover, we take note of the two events together. Hence we include a dummy from 1972-73 onwards to reflect the effects of price hikes and a dummy from 1991-92 onwards to refer to the economic reforms.

III. MONEY, INCOME, AND PRICES IN PAKISTAN

We start, following Husain and Rashid (2008), by presenting the descriptive statistics of the variables used in the analysis for both the full sample and the two sub-samples. Though the number of observations in sub-sample I is very low relative to the observations in sub-sample II, it can provide some insights regarding the percentage changes in the variables. The results are shown in Table 1.

Table 1

Descriptive Statistics for Growth in Money, Income, and Prices

	Real Money	Nominal Money	Real Income	Nominal Income	Prices
		Full Sample: (1960-61 – 2003-04)			
Mean	0.0605	0.1325	0.0540	0.1262	0.0720
Std. Dev.	0.0697	0.0541	0.0242	0.0491	0.0499
Observations	44	44	44	44	44
		Sample I: (1960-61 – 1971-72)			
Mean	0.0728	0.1010	0.0646	0.0910	0.0282
Std. Dev.	0.0434	0.0385	0.0263	0.0326	0.0332
Observations	12	12	12	12	12
		Sample II: (1972-73 – 2003-04)			
Mean	0.0559	0.1444	0.0500	0.1394	0.0885
Std. Dev.	0.0774	0.0548	0.0225	0.0481	0.0451
Observations	32	32	32	32	32
		Equality of Means and Variances			
Mean (t-value)	0.91	2.94**	1.70	3.81**	4.83**
Variance (F-value)	3.18**	2.02*	1.36	2.17**	1.84

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The table shows an average annual expansion of around 13 percent in nominal money. With an expansion of around 7 percent in prices, the real money has expanded by 6 percent. Similarly, nominal and real incomes have increased over time with an expansion of 12.6 percent and 5.4 percent respectively. The table further shows the descriptive statistics for the two sub-samples. Sub-sample I covers the period before the price hikes, whereas sub-sample II represents the periods after the price hikes. Moreover, we also conduct the tests for equality of means and variances between the two sub-samples. The results indicate significant increase in the means of the two nominal variables along with prices. In fact, the average expansion in prices has increased by three times in the second sample. The table also indicates significant increase in variations in real money as well as in the two nominal variables.

The formal investigation is done through Co-integration and Error Correction Model framework. At the first step, the variables are tested for the unit roots by applying both the ADF and PP tests. The results are reported in Table 2.

Table 2

Unit Root Tests for Money, Income, and Prices

	Levels		First Difference	
	W/O Trend	W. Trend	W/O Trend	W. Trend
ADF				
Real Money	–0.490	–3.303	–4.957**	–4.365**
Real Income	–2.837	–1.006	–6.119**	–6.666**
Nominal Money	0.314	–3.507	–5.012**	–4.488**
Nominal Income	–0.399	–1.455	–3.661**	–3.711**
Prices	0.089	–2.563	–3.548**	–3.558**
PP (W/O Trend)	(l=3)	(l=9)	(l=3)	(l=9)
Real Money	–0.214	–0.103	–4.886**	–4.763**
Real Income	–3.104**	–2.930**	–6.211**	–6.745**
Nominal Money	0.844	1.021	–5.014**	–4.888**
Nominal Income	–0.151	–0.162	–3.612**	–3.540**
Prices	0.487	0.469	–3.489**	–3.309**
PP (W. Trend)	(l=3)	(l=9)	(l=3)	(l=9)
Real Money	–2.540	–2.152	–4.823**	–4.682**
Real Income	–0.457	–0.556	–7.325**	–7.290**
Nominal Money	–2.600	–2.433	–5.006**	–4.852**
Nominal Income	–1.788	–1.992	–3.553*	–3.457*
Prices	–2.779	–2.727	–3.488*	–3.295*

Note: ** and * represent significance at 5 percent and 10 percent.

The table indicates that the variables are, in general, first differenced stationary, i.e., I(1). We now proceed to investigate the causal relation between the two variables by estimating the co-integrating regression suggested by Engle-Granger. If co-integration is found, the Error Correction Models are estimated. Otherwise, the Granger causality equations are estimated. In all cases the lag lengths are decided on the basis of Log Likelihood, Akaike and Bayesian information criteria. The next three sections investigate the causal relations between real money and real income, nominal money and nominal income, and nominal money and prices.

IV. CAUSALITY BETWEEN REAL MONEY AND REAL INCOME

We start by looking at the causal relation between the two real variables, real money and real income. In this context, we reproduced the results reported by Husain and Rashid (2008) indicating no short run and long run causal relations between the two variables. Table 3(a) shows the results.

Table 3(a)

Causality between Real Money and Real Income

	Cointegration (Engle-Granger)				
	Const.	Coeff.	ADF	PP(l=3)	PP(l=9)
RM on RY	–1.345***	1.035***	–1.092	–1.387	–1.358

Conclusion: No Co-integration

Granger Causality			**Granger Causality**		
Lag 1	DRY	DRM	Lag 3	DRY	DRM
DRY(–1)	–0.032	–0.115	DRY(–1)	–0.132	–0.348
DRM(–1)	0.059	0.270	DRY(–2)	0.267	–0.731
F-value	**0.917**	**0.055**	DRY(–3)	0.321	0.729
			DRM(–1)	0.086	0.394*
			DRM(–2)	–0.012	–0.089
			DRM(–3)	–0.916	–0.117
			F-value	**1.313**	**1.328**

Conclusion: No Short run Causality upto three lags

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

They, however, found significant impact on the relations between the two variables following the shift due to the start of the economic reforms in the 1990s. In this study we consider another important shift during the sample period, the shifts due to price hikes in the early 1970s.

Shifts in Real Money and Real Income Due to Price Hikes

To reflect the shifts in real variables due to the price hikes we introduce a dummy variable in the analysis that takes the value of one from 1972-73 onwards. The results are reported in Table 3(b).

Table 3(b)

Causality between Real Money and Real Income (Prices)

	Cointegration (Engle-Granger)					
	Const.	D	Coeff.	ADF	PP(l=3)	PP(l=9)
RM on RY	–3.863***	–0.428***	1.259***	–4.943***	–4.864***	–4.940***

Conclusion: Evidence of Co-integration

Error Correction Causality			**Error Correction Causality**		
Lag 1	DRY	DRM	Lag 3	DRY	DRM
D	0.059***	0.017	D	0.003	0.009
e(–1)	–0.008	–0.728***	e(–1)	0.062	–0.752***
DRY(–1)	–0.081	–0.446	DRY(–1)	–0.180	–0.293
DRM(–1)	0.058	0.369	DRY(–2)	0.334	–0.206
F-value	**0.711**	**1.474**	DRY(–3)	0.299	–0.334
			DRM(–1)	0.087	0.295*
			DRM(–2)	–0.019	0.058
			DRY(–3)	–0.093	–0.044
			F-value	**1.078**	**0.632**

Conclusion: Unidirectional Causality from Income to Money in the Long run
No Short run Causality

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The dummy variable in the co-integrating regression is highly significant indicating significant shift in the relation between real variables. The ADF and PP tests are also highly significant indicating the existence of a strong relation between real money and real income in the long run. The error term in money equation is also highly significant and verifies the strong long run relation between real variables. Finally, the analysis indicates a uni-directional causality from real income to real money in the long run. In the short run the real variables do not seem to affect each other.

Shifts in Real Money and Real Income Due to Both Prices and Reforms

To incorporate both the shifts, price hikes and economic reforms, we include another dummy, D2, which takes the value of one from 1991-92 onwards in addition to the dummy for prices, D1. The results are shown in Table 3(c).

Table 3(c)

Causality between Real Money and Real Income (Prices and Reforms)

	Cointegration (Engle-Granger)						
	Const.	D1	D2	Coeff.	ADF	PP(l=3)	PP(l=9)
RM on RY	–2.735***	–0.353***	0.124***	1.163***	–5.238***	–5.093***	–5.008***
Conclusion: Evidence of Strong Co-integration							
Error Correction Causality							
Lag 2	DRY	DRM					
D1	0.003	0.004					
D2	–0.026*	0.005					
e(–1)	0.051	–0.929***					
DRY(–1)	–0.338	–0.186					
DRY(–2)	0.012	0.171					
DRM(–1)	0.099	0.381**					
DRM(–2)	0.022	0.082					
F-value	**1.137**	**0.211**					
Conclusion: Unidirectional Causality from Income to Money in the Long run No Short run Causality							

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

Both the dummies are significant where the dummy for prices has a greater magnitude. The results remain the same as in the case where only the dummy for prices is included, that is, a uni-directional causality from real income to real money in the long run with no short run causality.

V. CAUSALITY BETWEEN NOMINAL MONEY AND NOMINAL INCOME

We now turn to examine the causal relation between the two nominal variables using the same procedure adopted earlier. The first set of results is shown in Table 4(a).

Table 4(a)

Causality between Nominal Money and Nominal Income

Cointegration (Engle-Granger)					
	Const.	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on NY	–1.100***	1.016***	–1.859*	–1.525	–1.451

Conclusion: Weak Evidence of Co-integration

Error Correction Causality			**Granger Causality**		
Lag 2	DNY	DNM	Lag 2	DNY	DNM
e(–1)	–0.037	–0.201*			
DNY(–1)	0.520**	–0.311	DNY(–1)	0.495***	–0.196
DNY(–2)	–0.012	0.125	DNY(–2)	–0.060	0.401**
DNM(–1)	0.085	0.208	DNM(–1)	0.115	0.261
DNM(–2)	0.019	–0.017	DNM(–2)	–0.009	–0.052
F-value	**0.182**	**1.061**	**F-Value**	**0.371**	**2.346**

Conclusion: Weak Evidence of Unidirectional Causality from Income to Money

Error Correction Causality			**Granger Causality**		
Lag 3	DNY	DNM	Lag 3	DNY	DNM
e(–1)	0.066	–0.075			
DNY(–1)	0.569**	–0.159	DNY(–1)	0.504***	–0.097
DNY(–2)	–0.069	–0.005	DNY(–2)	–0.115	0.097
DNY(–3)	0.209	0.559**	DNY(–3)	0.150	0.520**
DNM(–1)	0.020	0.034	DNM(–1)	0.061	0.104
DNM(–2)	0.049	0.017	DNM(–2)	0.019	0.022
DNM(–3)	–0.095	–0.025	DNM(–3)	–0.111	–0.056
F-value	**0.148**	**2.503***	**F-Value**	**0.288**	**4.034****

Conclusion: Unidirectional Causality from Income to Money at 3 Years Lag

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The PP tests in Co-integrating regression are insignificant rejecting any long run relation between the two nominal variables. However, the ADF test is significant at 10 percent level of significance. Hence, we can say that there is a weak evidence of any long run relation between the two nominal variables. The Error Correction equations verify the weak long run relation where the error term is significant at 10 percent in the money equation. The equations indicate a weak evidence of uni-directional causality from nominal income to nominal money in the long run with no short run causal effects. If we assume no Co-integration, the Granger equations show the evidence of income affecting money at 2nd lag, although the F-test is not statistically significant.

Following Husain and Rashid (2008) we report the analysis for the 3rd lag too. The results show that the error term in error correction equations has become insignificant implying no long run relation between money and income. The equations further show the significant effects of income on money at 3rd lag verified by F-value. The same result is shown by Granger equations if we ignore the error term.

Hence, there is evidence of a one-way causation from nominal income to nominal money although the existence of a long run relation between the two nominal variables is not clear. There is also persistent evidence of nominal income affected by its own first lag and affecting money at three years' lag. We now proceed to take note of the shifts in nominal variables during the sample period.

Shifts in Nominal Money and Nominal Income Due to Price Hikes

The results reflecting the shifts in nominal variables due to the price hikes in the early 1970s are reported in Table 4(b) which shows that as in the case of real variables the shift in the relation of nominal variables due to the price hikes is very significant. Once again, the ADF and PP tests have become highly significant indicating strong evidence of a long run relation between the two nominal variables. However, the most significant change occurs in the direction of causality. Now the results show the bi-directional causality between nominal money and nominal income in the long run. In the short run, however, no causal relation between the two still prevails. Following the procedure adopted previously, we do the analysis for the third lag that also indicates significant change. The persistent three years lag effect of income on money now disappears.

Table 4(b)

Causality between Nominal Money and Income (Prices)

	Cointegration (Engle-Granger)					
	Const.	D	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on NY	–1.846***	–0.393***	1.097***	–4.631***	–4.479***	–4.407***

Conclusion: Evidence of Co-integration

Error Correction Causality			**Error Correction Causality**		
Lag 2	DNY	DNM	Lag 3	DNY	DNM
D	0.066**	0.060*	D	0.056*	0.050
e(–1)	–0.369***	–0.449***	E(–1)	–0.474***	–0.359**
DNY(–1)	0.239	0.046	DNY(–1)	0.236	0.045
DNY(–2)	0.205	0.018	DNY(–2)	0.098	–0.075
DNM(–1)	–0.072	0.317**	DNY(–3)	0.370*	0.324
DNM(–2)	–0.041	–0.011	DNM(–1)	–0.214	0.191
F-value	**0.230**	**0.063**	DNM(–2)	0.000	0.018
			DNM(–3)	–0.118	–0.065
			F-value	**1.082**	**0.753**

Conclusion: Bidirectional Causality between Income and Money in the Long run
No Short run Causality

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

Hence by incorporating the shifts in the nominal variables due to the price hikes we have found the feedback mechanism of money in changing income in Pakistan. It may be mentioned here that Husain and Rashid (2008) in a similar kind of analysis that took note of the shift due to the economic reforms did not find such mechanism of money. We now consider both the shifts, the shifts due to the price hikes and the economic reforms, together to further explore the issue.

Shifts in Nominal Money and Nominal Income Due to Both Reforms and Prices

The results reflecting both the shifts are reported in Table 4(c).

Table 4(c)

Causality between Nominal Money and Income (Prices and Reforms)

	Cointegration (Engle-Granger)						
	Const.	D1	D2	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on NY	–1.451***	–0.321***	0.117**	1.059***	–4.597***	–4.411***	–4.226***

Conclusion: Strong Evidence of Co-integration

Error Correction Causality			**Error Correction Causality**		
Lag 2	DNY	DNM	Lag 3	DNY	DNM
D1	0.080***	0.064*	D1	0.064**	0.054
D2	–0.022	–0.015	D2	–0.012	–0.007
e(–1)	–0.442***	–0.549***	e(–1)	–0.600***	–0.438**
DNY(–1)	0.186	0.001	DNY(–1)	0.193	0.010
DNY(–2)	0.252	–0.132	DNY(–2)	0.192	–0.157
DNM(–1)	–0.076	0.312*	DNY(–3)	0.407**	0.279
DNM(–2)	–0.028	–0.002	DNM(–1)	–0.239	0.201
F-value	**0.250**	**0.209**	DNM(–2)	0.003	0.021
			DNM(–3)	–0.098	–0.081
			F-value	**1.352**	**0.522**

Conclusion: Bidirectional Causality between Income and Money in the Long run
No Short run Causality

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The table shows that, as in the case of real variables, the two dummies are significant and the dummy for prices has greater magnitude. It can be seen that the result regarding causality is similar to the one when only one dummy, the dummy for prices, is included.

Hence, the analysis indicates, as in the case of real variables, significant shifts in the nominal variables during the sample period. Similarly, the shift that occurred in the early 1970s due to price hikes seems to be very crucial to be incorporated in the analysis as it significantly changes the results. The results indicate the existence of a long run relation between nominal money and nominal income where the two variables seem to affect each other in the long run. In the short run, however, the two nominal variables, as the real variables, appear to be independent of each other.

VI. CAUSALITY BETWEEN NOMINAL MONEY AND PRICES

Finally, we investigate the causal relation between nominal money and prices using the same procedure adopted in the previous sections. The first set of results is reported in Table 5(a).

Table 5(a)

Causality between Nominal Money and Prices

	Cointegration (Engle-Granger)				
	Const.	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on DF	3.850***	1.697***	–3.696***	–2.687***	–2.477**

Conclusion: Strong Evidence of Co-integration

Error Correction Causality		
Lag 2	DDF	DNM
e(–1)	–0.314***	–0.071
DDF(–1)	0.589***	–0.349
DDF(–2)	0.216	0.496*
DNM(–1)	0.163	0.167
DNM(–2)	0.003	0.045
F-value	**0.898**	**2.446**

Conclusion: Unidirectional from Money to Prices in the Long run

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

Both the ADF and PP tests are highly significant indicating the existence of a long run relation between money and prices in Pakistan. The error correction equations suggest a uni-directional causality from money to prices in the long run. However, in the short run there is evidence of prices affecting money at 2nd lag although F-value is not significant. Once again as in the case of nominal income we do the analysis for the 3rd lag. However, the result (not reported here) shows no significant lags in either equation indicating no short run causal effects. However, it verifies the uni-directional causality from money to prices in the long run.

Shifts in Money and Prices Due to Price Hikes

The results reflecting the shifts in the two variables due to the price hikes in the early 1970s are reported in Table 5(b).

Table 5(b)

Causality between Money and Prices (Prices)

	Cointegration (Engle-Granger)					
	Const.	D	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on DF	3.702***	–0.172**	1.755***	–3.915***	–2.924***	–2.734***

Conclusion: Evidence of Co-integration

Error Correction Causality		
Lag 2	DDF	DNM
D	0.097***	0.038
e(–1)	–0.462***	–0.054
DDF(–1)	0.393***	–0.324
DDF(–2)	0.244*	0.490*
DNM(–1)	–0.002	0.153
DNM(–2)	–0.046	0.032
F-Value	**0.130**	**2.068**

Conclusion: Unidirectional from Money to Prices in the Long run

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The dummy variable in the co-integrating regression shows signs of a significant shift in the relationship of money to prices. However, the results remain the same, that is, a unidirectional causality from money to prices in the long run with indication of prices affecting money at two years' lag.

Shifts in Money and Prices Due to Both Reforms and Prices

Finally, the results reflecting both the shifts are reported in Table 5(c).

Table 5(c)

Causality between Money and Prices (Prices and Reforms)

	Cointegration (Engle-Granger)						
	Const.	D1	D2	Coeff.	ADF	PP(l=3)	PP(l=9)
NM on DF	3.556***	–0.220**	–0.081	1.799***	–3.953***	–2.993***	–2.787***

Conclusion: Strong Evidence of Co-integration

Error Correction Causality		
Lag 2	DDF	DNM
D1	0.102***	0.039
D2	–0.010	–0.008
e(–1)	–0.446***	–0.076
DDF(–1)	0.307**	–0.311
DDF(–2)	0.164	0.452*
DNM(–1)	–0.039	0.162
DNM(–2)	–0.054	0.032
F–value	**0.350**	**1.777**

Conclusion: Unidirectional from Money to Prices in the Long run

Note: ***,**, and * represent significance at 1 percent, 5 percent and 10 percent.

The table shows that the shift in the money-price relationship is significant in the case of price hikes but not in the case of reforms. Once again, the results have not changed. Hence, there is persistent evidence of a uni-directional causality from money to prices in the long run.

Hence, we can say that the relationship between money and prices in Pakistan does not seem to be affected by the shifts in the variables during the sample period. However, the shift that occurred in the early 1970s due to price hikes seems to be greater in this case too. The results indicate the existence of a long run relation between money and prices where money seems to lead prices in the long run. In the short run there is some indication, though not significant, of prices affecting money with two years' lag. There is also persistent evidence of prices affected by their own first lag.

VI. SUMMARY AND CONCLUSIONS

The objective of this study is to extend the analysis of causality by Husain and Rashid (2008) by taking cognizance of the shift in the variables due to the price hikes in the early 1970s. Following them we investigate the causal relations between real money and real income, between nominal money and nominal income, and between nominal money and prices using the annual data set from 1959-60 to 2003-04, examining the stochastic properties of the variables used in the analysis, and in consideration of the expected shifts in the series through dummy/ies.

The formal analysis indicates significant shifts in the variables during the sample period. These shifts include the price hikes in early 1970s and the start of the economic reforms in early 1990s. In this context, the shift occurred in the early 1970s seems to be more important to be incorporated in the analysis. In particular, it seems to be very crucial in the case of nominal variables as it has significantly changed the results.

The analysis further indicates the existence of a long run relationship between real money and real income provided that shifts in these variables are given consideration. Moreover, real income seems to be the leading variable that affects real money in the long run. In the short run, the two real variables appear to be independent of each other. Similarly, when money and income are expressed in nominal terms, there is evidence of a one-way causation from income to money although the existence of a long run relationship between them is not clear.

However, the relationship between the two nominal variables is significantly affected by the shift due to the price hikes in the early 1970s. Taking note of the shift indicates the existence of a strong long run relation as well as bi-directional causality between nominal money and nominal income. The results do not change if we also include the shift representing reforms. In the short run, however, the two nominal variables, like real variables, appear to be independent of each other.

As regards the money-price relationship in Pakistan, the analysis shows a long run relation between the two where money seems to lead prices in the long run. In the short run there is some indication, though not significant, of prices affecting money with two years lag. These findings regarding money-price relationship are not affected by the shifts during the sample period.

Finally it can be said that the study finds an active role of money in the Pakistani economy as it is found to be the leading variable in changing prices without any feedback. In the case of income, the study finds the feedback mechanism of money generally missing in earlier studies which may be because of not taking note of the shift in the macro economic variables in Pakistan in the early 1970s.

Limitations of the Study

At the end we would like to point out the limitations which can be considered in future research. This study mainly follows Husain and Rashid (2008) and uses the same sample period, data sources and methodology, except that it examines the impact of a different shift, that is, the shift due to price hikes. Both studies confine to the Bi-variate Causal analysis. However, the extension of the analysis to Multi-variate causal analysis may provide better insights regarding the role of these variables. Similarly, the two studies are based on annual data covering the period from 1959-60 to 2003-4. As mentioned above, various economic and political events have occurred with a significant impact on the macro economic variables. One of the significant event was the separation of the Eastern wing of the country in 1971 that may cause significant effects on macroeconomic variables. Therefore, the use of quarterly data covering the last two decades should be a better option.

On the technical side, the use of recent unit root tests taking care of structural break in the series would be better than the conventional tests used in the study. Similarly, the studies have used the Ordinary Least Square (OLS) approach to test for

money, output and prices causality. However, OLS may not be useful in the presence of conditional heteroskedastic errors. In this context, the use of Maximum Likelihood (ML) technique may be better because this technique has a better power to detect causality.

REFERENCES

Abbas, Kalbe (1991) Causality Test between Money and Income: A Case Study of Selected Developing Asian Countries (1960–988). *The Pakistan Development Review* 30:4, 919–929.

Barth, J. and J. Bannett (1974) The Role of Money in the Canadian Economy: An Empirical Test. *Canadian Journal of Economics* May, 306–311.

Bengali, K., A. Khan, and M. Saddaqat (1999) Money, Income, Prices and Causality: The Pakistani Experience. *Journal of Developing Areas* 33: Summer, 503–514.

Brillembourg, A. and M. Khan (1979) The Relationship between Money, Income, and Prices: Has Money Mattered Historically? *Journal of Money, Credit, and Banking* August, 358–365.

Dereyes, F., D. Starleaf, and G. Wang (1980) Test of Direction of Causation between Money and Income in Six Countries. *Southern Economic Journal* October, 477–487.

Husain, F. and Abdul Rashid (2002-2008) Economic Liberalisation and the Causal Relations Among Money, Income, and Prices: The Case of Pakistan. *Pakistan Journal of Applied Economics* 18, 103–121.

Jones, J. D. and N. Khilji (1988) Money Growth, Inflation, and Causality: Empirical Evidence for Pakistan (1973-85). *The Pakistan Development Review* 27:1, 45–88.

Khan, A. and A. Siddiqui (1990) Money, Prices and Economic Activity in Pakistan: A Test of Causal Relation. *Pakistan Economic and Social Review* Winter, 121–136.

Lee, S. and W. Li (1983) Money, Income, and Prices and their Lead-lag Relationship in Singapore. *Singapore Economic Review* April, 73–87.

Pakistan, Government of (1998) *50 Years of Pakistan in Statistics*. Islamabad: Federal Bureau of Statistics.

Pakistan, Government of (Various Issues) *Economic Survey*. Ministry of Finance.

Pakistan, Government of (Various Issues) *Monthly Statistical Bulletin*. State Bank of Pakistan.

Phillips, R., and P. Perron (1988) Testing for a Unit Root in Time Series Regression. *Biometrika* June, 335–346.

Schwert, W. (1987) Effects of Model Specification on Tests for Unit Roots in Macroeconomic Data. *Journal of Monetary Economics* July, 73–103.

Siddiqui, Anjum (1989) The Causal Relation Between Money and Inflation in a Developing Economy. *International Economic Journal* (Summer), 79–95.

Sims, C. (1972) Money, Income, and Causality. *American Economic Review* September, 540–552.

Williams, W., C. Goodhart, and D. Gowland (1976) Money, Income, and Causality: The U.K. Experience. *American Economic Review* June, 417–423

Book Reviews

William J. Baumol, Robert E. Litan and Carl J. Schramm. *Good Capitalism, Bad Capitalism and the Economics of Growth and Prosperity*. New Haven: Yale University Press, 2007. 321 pp.

The central idea of the book is that Capitalism has many forms—some good, others bad, with entrepreneurial capital being the best. The authors argue that the spectacular economic performance of the developed world is owed to the 'good capitalism' practised over there and that the blame for the poor performance of many economies must lie with one or the other kind of 'bad capitalism', that these economies continue to practise. The authors identify policy tools that can help countries in making a transition from 'bad capitalism' to 'good capitalism'.

The introductory chapter 'Entrepreneurship and Growth' gives an overview of the key elements of an entrepreneurial economy. In the next chapter, the authors question 'Why Economic Growth Matters' and convincingly rebuff those who question the virtues of growth. To those who put limits on growth the authors' answer is: "the same process of technological advancement that undermined Malthus' dire prediction about population growth may be able to quiet the concerns of modern day Malthusians who worry about disappearing energy".

Chapter 3 conducts a comprehensive review of modern growth theories with special focus on innovation and institutions. After reviewing the work of Solow, the authors move directly to the influence of institutions on growth. They argue that institutions take time to develop and that growth depends on 'home grown' institutions. The long time required to develop growth promoting institutions may explain why dictators have been successful in Korea and Singapore in boosting growth, while the time horizon of the politician is shorter, at best extended up to the next elections. The authors' emphasis upon 'home grown' institution is also a verdict against the Washington Consensus.

Chapter 4, the central part of the book, argues that capitalism has four types—state-guided capitalism, oligarchic capitalism, big-firm capitalism and entrepreneurial capitalism. The state-guided capitalism, in which government decides which sectors shall grow, has several downsides: excessive investment, picking the wrong winners, susceptibility to corruption and difficulties of ending support when it is no longer appropriate. Oligarchic capitalism differs from the state-led capitalism mainly in the impetus of its leaders. The oligarchic capitalism protects a very small fraction of the population, and perhaps only the ruler(s). Countries following this type of capitalism experience extreme inequality and corruption. The big-firm capitalism plays on the scale economies concept. However the big firms often engage in rent-seeking and thereby lose their competitive advantage. Entrepreneurial capitalism is focused on innovations. These innovations are usually small scale in nature, led by individuals and start up firms.

However, it takes big firms to mass produce and market the product of innovation. So the optimal combination of capitalism is a mix of big and small. This is the kind that characterises the United States more than any other country. But then this is the very kind of capitalism that caused the recent global financial crisis.

Chapter 5 'Growth on the Cutting Edge' describes the four key elements of the successful entrepreneurial economy. These include: ease of establishing a business, incentives and rewards for productive entrepreneurial activity, rule of law, antitrust institutions.

Chapter 6 suggests how the less developed economies may move away from state-guided and oligarchic varieties of capitalism to entrepreneurial capitalism. The developed economies have reached a high level of economic activity beyond which lies the prospect of stagnation and retreat. Chapter 7 provides suggestions on how to avert stagnation and retreat and recommends measures to sustain and mobilise growth for meeting the upcoming demographic challenges.

How the United States can maintain its unusual blend of big-firm capitalism and entrepreneurial capitalism in times to come is discussed in the next chapter. The authors suggests four broad preconditions for the right of blend of entrepreneurial and big-firm capitalism. The authors also believe that there is much to learn from the American experience.

In discussing the diversity of the capitalist economies the book provides thoughtful material for students of the phenomenmon of economic growth. The importance of innovation in economic growth is not often mentioned in literature where the role of the entrepreneur is emphasised. Creation of an institutional setting which the book underlines as a necessity for sustaining entrepreneurship lends support to failure of governance in democracies like Pakistan where scant attention was paid to institution building

Naseem Akhtar

Pakistan Institute of Development Economics,
Islamabad.

Steven D. Levitt and Stephen J. Dubner. *Superfreakonomics: Global Cooling, Patriotic Prostitutes, and Why Suicide Bombers Should Buy Life Insurance.* London: Penguin Books Ltd. 2009. 270 pages. Paperback. £ 14.99.

Behavioural economics is an emerging field and superfreakonomics provides useful insights into human behaviour observed with respect to issues that have economic implications. The underlying theme of the book is that human beings respond to incentives. The authors have set up a number of interesting examples to convey how different incentives work.

The case studies discussed in the book are based on the authors' recent academic research; motivated by fellow economists as well as engineers and astrophysicists, psychotic killers and emergency room doctors, amateur historians and transgender neuroscientists. Most of the stories fall into one of the two categories: things you always thought you knew but in fact did not; and things you never knew you wanted to know, but do know.

The authors, with the help of data, show that drunk walking is eight times more dangerous than drunk driving. The message is that the misaligned incentives (penalties) are responsible for this—only drunk driving is penalised. To show the influence of positive incentives the authors demonstrate how cable TV might have improved the status of women in India. A baby Indian girl, who does grow into adulthood, faces discrimination in provision of education, health care and remuneration in job market. In a national health survey, 51 per cent of Indian men said that wife-beating is defensible under certain situations and more surprisingly, 54 per cent of the women agreed. But things are changing, albeit at a slow pace. The authors find that cable TV has empowered Indian rural women—families with cable TV are more likely to have a lower birth rate and more schooling.

In Chapter 1 of the book the authors explore the various costs of being a woman. They argue that it is hard to be a woman, in any country, whether developed or under developed. Practices, such as abandoning a girl child in China and remuneration-discrimination in corporate America, make it difficult to lead a woman's life. The authors also attempt to understand the demand curve for prostitutes. Based on empirical evidence, they suggest that a street prostitute is similar to a department store—both take advantage of the higher job opportunities caused by holidays.

Next, the authors discuss some compelling facts about the causes of death. They point out that though death from suicide is 575 times more likely than death in a terror attack, still more attention is devoted to protection against terrorism. The lesson is but obvious—check only what is controllable. Another section, pointing to a similar conclusion, talks about the remarkable work one guy has done to make hospitals more efficient and to protect patients against misdiagnoses, medication errors, bacterial infections and technical complications.

Chapter 3 cites various cases of altruism and apathy leading to the conclusion that people are typically neither as good as thought to be nor as bad as perceived. Resolution of apparently difficult problems is found amazingly easy in the following chapter. The authors discuss the unintended consequence of the law: 'Americans with Disabilities Act'—the law designed to protect disabled Americans' rights at the work place, has in fact led to fewer job opportunities for the disabled. The reason is simple, point out the

authors: the Act has made it difficult for the employers to discipline or lay off a disabled person. The employers responded by not hiring a person with a disability. Discussing unintended consequences further, the authors state that politicians, at times behave as economists do. They use prices to encourage good behaviour. For example, in recent years, many governments have based their trash pick-up fees on trash volume—people made to pay for each extra bag of garbage, will generate less of it. However the volume charge has motivated citizens to stuff their bags fuller and dump garbage elsewhere. In Ireland, for example, new garbage tax resulted in increased backyard trash burning—bad for environment as well health.

The authors also discuss how the discovery of oil in United States has functioned as the Endangered Species Act—saving whales from extinction. By 19th century whale hunting was the engine that helped turn the United States into a powerhouse. Whale oil was a lubricant for all sorts of machinery but most of all it was used as lamp fuel. The demand for whale oil was so great that people hunted the whale, almost to extinction. Accordingly oil shortage appeared and prices rose. Today, such an industry might be considered 'too big to fail' but the whaling industry was failing indeed, with grim repercussions for United States. But then someone discovered oil in the ground. The new oil industry has provided job opportunities for the unemployed whalers and, as a bonus, has functioned as the Endangered Species Act, saving the whale from near-certain extinction.

In the last chapter, the authors take a cool, hard look at global warming. They discuss how Intellectual Ventures like geo-engineering can probably hold up the effects of global warming for a while. This would provide many additional decades to make the changes required in production and use of energy. Among other things, Intellectual Ventures, has thrown up ideas about putting an end to the threat of global warming and severe hurricanes. The authors have done a good job describing the idea. The question of how the idea should be put to practice has been left open.

For the interest of the general reader there is a whole lot of case studies in the book that would give new insights on common problems.

Umaima Arif

Pakistan Institute of Development Economics,
Islamabad.

Amartya Sen. *The Idea of Justice*. London: Penguin Books Ltd. 2009. 468 pages. Hardback. £ 25.00.

Justice is comparative in nature and may have plural impartial dimensions. Provision of justice, in an 'ideal sense', is non-pragmatic and is therefore impossible to deliver, argues the Nobel Laureate, Amartya Sen. He divides the existing theories of justice into two categories: the transcendental institutionalism and the Comparative School. The transcendental institutionalism, led by eminent enlightenment philosophers like Locke, Hobbes, Rousseau and Kant holds that a just society can be maintained by ensuring justice in the 'ideal sense'. The provision of 'ideal justice' is based on the notion of either right or wrong. To provide justice in the 'ideal sense' the society must enjoy access to 'just institutions'. John Rawl, the more recent contributor to transcendental tradition, came up with his theory of 'justice as fairness' in the mid twentieth century. The comparative school of justice propagated by Adam Smith, Marquis de Condorcet, Carl Marx and Stuart Mill lays emphasis upon looking at 'justice' in a comparative sense and on the basis of what the society is actually able to realise.

Sen, disagreeing with both the schools of thought, however, is seen leaning towards the comparative school. The author gives the example of three children and a single flute to demonstrate how the 'ideal justice' and the 'comparative' school fail to hold water in certain situations. Three children—Carla, Anne and Bob, claim their right to a specific flute on different but competing principles. Carla manufactured the flute, Anne is the only one among the three who can play the flute, while Bob is the poorest of the three and does not have any toy to play with. Sen questions how 'ideal justice' may be provided with the transcendental approach, or how the 'comparative assessment' would lead to an impartial and non-arbitrary solution, in the case of the 'three children and a flute'. Despite his disagreement with both the schools of thought, Sen aligns himself with the comparative school. However he believes that for provision of 'impartial justice' competing principles need not essentially be unique; these could be plural as well. The plurality of competing principles is the essence of Sen's 'idea of Justice'.

The book discusses four broad themes: the demands of justice; forms of reasoning; the materials of justice; and public reasoning and democracy. In the first part, while explaining the demands for justice, Sen discusses the prevailing theories of justice including the Contractarian approach, Adam Smith's 'Impartial Spectator'; and John Rawl's 'Justice as fairness'. Sen, points out, that the three theories have discussed social justice within the framework of reasoning and objectivity. Even the enlightenment tradition of Europe and the social justice provided by the great Mughal emperor, Akbar, found the basis for epistemology of justice, in reasoning and objectivity (Akbar called it *rah-i-aql*).

To Sen, the basic problem with these theories is the assumption that absolute social justice exists somewhere and can be delivered. He believes that disregard for the comparative assessment is inappropriate. Sen also criticizes Rawl's approach on the ground that 'just institutions' which have been assumed to exist are not easy to find. Sen believes that individual incentives would hinder the formulation 'just institutions' which are required to vindicate Rawl. He thinks that institutions are contingent upon human behaviour and would change with change in actual human behaviour.

Sen believes that the views of Kenneth Arrow on provision of justice are more pragmatic as compared to Rawl's 'justice as fairness' formulation. Arrow in his social choice theory accepts the possibility of justice in its comparative nature and permits the plurality of competing principles (both of which are core ideas in Sen's analysis). Sen is also impressed with Adam Smith's 'impartial spectator' especially with his idea of 'open impartiality' and 'closed impartiality'. As Sen puts it; *"the procedure of achieving impartiality is open rather than closed and confined to the perspectives and understandings of the local community only"*. One reason for global tension, argues Sen, is inherent in the effort to impose 'the idea of justice' prevalent in one society, onto another society without giving regard to the fact that the 'idea of justice' may vary from society to society. To Sen, justice is comparative in nature and is based upon plural and impartial competing principles.

In the second part of the book, different forms of reasoning have been discussed with focus on human limitations with respect to observation and judgment. Sen argues that human limitations like positional variations, health problems, illusions and narrow perspective of the individuals concerned, may affect reasoning and hence the provision of 'justice'. Rationality, one of the crucial assumptions for many economic theories, is dependent on the above referred variables. But for Sen, even the assumption of rationality is quite misunderstood. He critically examines the rational choice theory and concludes that rationality not only encompasses self-interest and individual preferences but incorporates the well being of other individuals as well—doing good for others, as has been seen frequently observed, is quite a rational choice for individuals, argues the author.

Sen goes on to explain the difference between the narrow notion of rationality held in economics and the rational choices actually observed. He suggests that sometimes individuals sacrifice their utility to let others maximise their own. To substantiate this, Sen gives an example: a person occupying window seat in a plane and enjoying the view outside, would perhaps pull down the shutter to let his fellow passenger play a computer game—sacrificing own utility to let others maximise theirs.

The third part of the book is devoted to the pre-requisites for provision of justice, to what Sen refers to as the 'materials of justice'. He terms freedom, capability, liberty and equality as the 'materials of justice'. The author goes on to explain as to what he means by these terms in the context of provision of justice. According to Sen, freedom provides opportunities and facilitates the process of making choices. Capability includes not only what an individual has been observed to do but also what he might do, given the opportunity. Here Sen brings in the issue of poverty. He argues that a man's poverty could be due to lack of opportunities or due to a disability to do something. The provision of justice then depends upon effective freedom which in turn is based on equality and liberty.

To conclude, provision of justice requires not only effective freedom but also capabilities with equality and liberty. Sen, gives an example to explain how the 'materials of justice' supplement each other: a young guy, Prude, hates to read a specific book, but he would suffer if someone else read that book. There is another guy, Lewd, who loves to read that book, but he would leave the book for Prude to read. Sen argues that the 'materials of justice' generate plurality of impartial justice but may not yield a Pareto-efficient solution (the 80-20 rule) unless we get accustomed to the idea that Pareto- efficient solutions could be plural.

The final part of the book is devoted to public reasoning and democracy. Sen admires the advantage of democracy as a tool to express public opinion but he disagrees with those who think that democracy is the outcome of western philosophy—he shows that the different forms of democracy can be traced to the ancient Greek and Buddhist regimes. Even some forms of democracy could be observed in the Middle East when Europe was passing through the dark ages. It is the media that propagates public opinion in democracies, argues Sen. He lays stress on the role of free media, an influential political opposition and a powerful legislature for the public opinion to dominate and to minimise famines, violence and anarchy in the society. He even argues, that strong democracies have witnessed lesser famines and deaths compared to sham democracies. The famine of Bengal, according to Sen, got aggravated due to the absence of free media and an influential opposition under the then Indian regime. In another chapter while discussing human rights, Sen argues that these are the product of individual freedom. These rights are inalienable to the human beings and provide the bases for liberty and equality, which in turn ultimately contribute to the provision of justice.

Sen's book provides a pragmatic analysis of different aspects of justice and convincingly argues for the possible existence of 'plural impartial competing principles' for establishment of justice in society. This new idea may influence current thinking on the concept and provision of justice.

Mutee-ul-Rehman

Pakistan Institute of Development Economics,
Islamabad.

Shorter Notices

Rob Tripp. *Biotechnology and Agricultural Development: Transgenic Cotton, Rural Institutions and Resource-poor Farmers*. 2009. 280 pages, Hardbound, £ 90.00.

'Biotechnology and Agricultural Development' edited by Rob Tripp, explores how biotechnology can be used to increase agricultural productivity. The book examines case studies from China, India, South Africa and Colombia to study the impact of biotechnology on agricultural output.

The case studies suggest that the use of biotechnology has helped increase agricultural production and alleviate poverty. The studies included in the volume examine the impact of BT cotton and transgenic varieties on the productivity of small farmers. The agronomic performance of GM cotton has also been discussed. The studies suggest that more information about the benefits of transgenic varieties and offer of choices to growers in the use of different varieties, will contribute to greater use of the transgenic varieties. The role of technology for controlling the impact of insect- borne diseases has also been examined in one of the studies.

The book also explores the prospects of using genetically modified crops in developing countries. One of the studies examines the role of institutions in promoting the use of biotechnology. Specifically, the study examines how the poor farmers may benefit from the adoption modern technologies? What role institutions may play in this regard? What institutional shortcomings hinder the use of biotechnology? How the poor farmers may participate in input and credit markets? How the farmers' access to information may be improved and, finally, how the regulatory regimes may be improved? Another study examines the institutional correlates for the introduction of transgenic varieties of cotton, with special focus on the seed and input industry, intellectual property regimes and input delivery. The studies included suggest that more attention should be devoted to the development of local institutions required for technology generation, technology delivery and increasing farmers' capacity to demand more services. *(Anwar Hussain)*

Robin Boadway and Anwar Shah. *Fiscal Federalism, Principles and Practice of Multiorder Governance.* Cambridge University Press. 2009. 620 pages. Hardbound. US$ 26.95.

The concept of fiscal federalism has drawn much attention over the last three decades. Developments like globalisation and conflicts, local as well regional, have made it crucial to revisit the question of the division of responsibilities amongst various tiers of the government, argue the authors. The book evaluates the merits and demerits of decentralisation and highlights the trade-offs involved in making the right choice between

centralisation and decentralisation. The standard criticisms of fiscal federalism are; causes macroeconomic instability, augments regional disparities, and promotes corruption. The authors rebut these criticisms convincingly and argue that a decentralised fiscal system presents the most viable way for improving macroeconomic governance and regional fiscal equity.

The authors present various models of federalism by differentiating between unitary forms and federal forms of constitutions. The local governance models of developed countries discussed in the book furnish lessons for fiscal reform in developing countries. The authors point out that the disparity between the revenue means and expenditures needs of the lower tiers of government is common in countries which have adopted a federalist structure. Such fiscal gaps, they argue, should be eased by transferring federal sources of revenue to the sub-national governments. The authors favour lesser reliance on inter-governmental transfers by the sub-national governments. They point out that in OECD countries, inter-governmental transfers, on average, constitute only about one- third of the sub-national expenditures, whereas this figure is as high as 60 per cent for developing countries. The authors recommend lesser inter-governmental transfers as the aim as this allows greater autonomy to the lower tiers of the government.

Talking about the function of sub-national governments, the authors emphasise that local governance not only involves providing local services, like sanitation and street lightning, but also includes protecting the life and liberty of the citizens. The authors view the expenditures on health and education as the most essential amongst the various kinds of public expenditures at the local level. They argue that the decentralised process of decision-making should lead to the kind of public service delivery that is consistent with local preferences

The book summarises the vast and varied literature on the construction of fiscal constitutions and their implementation. It suggests that as the fiscal constitutions sketch the process of revenue generation and expenditures at various tiers of government, therefore, regulatory checks should be part and parcel of the fiscal constitution for responsible, decentralised governance. *(Abdul Qayyum Khan)*

Malcolm Gladwell. *Outliers, the Story of Success*. London: Penguin Group. 2008. 309 pages. Pak Rs 995.00.

Why some people outperform all others and what is behind some highly unusual occurrences is the subject matter of ‘Outliers’ written by Malcolm Gladwell, the author of Tipping Point and Blink. The author follows a journalistic style of writing to explain the secret of successful people. He uses many examples, stories, case studies and interviews to suggest what kind of people outperform. Gladwell argues that intelligence is not the only key to success, rather success is a combination of ability, opportunity and a particular environment in which the Outliers (extraordinary people) grow up.

Success also depends upon access to opportunity, the author argues. To support his contention he mentions that the famous IT guys, like Bill Gates, Paul Allen, Steve Ballmer and Eric Schmidt, were in their early twenties when the IT revolution began in 1975. These guys were well positioned then to take advantage of the new opportunities in the IT field. However the author suggests that the mere access to opportunity is not enough—opportunity can be translated into success only with hard work. The author cites

the example of Bill Joy and Bill Gates to prove his point. Bill Joy had spent around 10,000 hours doing computer programming in University of Michigan. Later his extensive practice enabled him to write the architecture language, which earned him a fortune. Similarly, Bill Gates had spent thousands of hours behind the computer since the age of 13.

The second part of the book implicitly argues that cultural heterogeneity adversely influences organisational work performance. The author cites the case of relatively higher level of plane crashes faced by the Korean airline. Deeper analysis of the causes of air crashes revealed that pilot, co-pilot and aviation officials belonged to different cultures. This cultural heterogeneity made communication difficult amongst them and thereby contributed to some air crashes. The Korean airline acknowledged that culture is at the root of some of their problems. The airline upgraded its safety standards and was bestowed with an award, in 2006, for its good safety standards and transformation. (*Hafsa Hina*)

Naureen Talha. *Jinnah's Role in Strengthening Pakistan's Economy (1947-48*). Islamabad: National Institute of Pakistan Studies, Quaid-i-Azam University, 2008. 252 pages. Hardbound. Rs 250.00.

The book is focused on the economic management of Pakistan during the short rule of Quaid-i-Azam Muhammad Ali Jinnah as the governor-general and the preparatory work that he had initiated well before the independence of Pakistan. After the introduction, the first chapter outlines the post Mughal economic condition of the Indian Muslims. According to the author, the Muslims had realised that given the western education acquired by Hindus and Parsis, the Muslims would be at a perpetual disadvantage economically. The author argues that such economic factors had contributed as much to the Pakistan Movement, as the political ideology did. Therefore, under the leadership of Mr Jinnah, the establishment of Muslim businesses and commercial organisations became a core objective of the All India Muslim League. The committed Muslim businessmen and industrialists invested their money and effort to achieve the objective.

The second chapter looks at Mr Jinnah's efforts in setting up of the Planning Committee in 1944. The very fact that Jinnah thought of setting up such a committee as early as 1944 speaks of his acumen, the committee was asked to survey the economic conditions of the Muslims and prepare them to participate in commercial activities, agricultural expansion and industrialisation. The committee submitted its report in 1945, giving adequate attention to all sectors of the economy.

The third chapter provides detail of the business bodies and enterprises established before the Partition by the Muslims on Mr Jinnah's persuasion. These included the Federation of Muslim Chambers of Commerce and Industry in 1944, commercial banks and newspaper network, including *Pakistan Times*, *Morning News*, *Dawn* and *Star of India*.

Chapter 4 furnishes detail of the suggestions put up by Mr Jinnah's industrialist friends for industrialisation of Pakistan. The suggestions included establishment of factories for manufacturing automobiles, radio and electrical goods, cement and textiles. In the services sector, the group recommended setting up facilities for banking and insurance, transport and technical education.

Chapter 5 recounts the response of the Muslims to the propaganda against the economic viability of Pakistan. Other issues, like division of assets between Pakistan and India and setting up of the central government have also been discussed in this chapter.

The last chapter of the book segregates the post-independence economic achievements of the Quaid into two parts. Part 1 is devoted to the economic achievements during the first four months of Mr Jinnah's rule while his accomplishments from January to September 1948 have been discussed in the second part. The first four months saw the establishment of the first textile mill in Karachi, Karanphuli hydro electric power plant in the then East Pakistan and four polytechnic institutes. To overcome the financial crunch, Mr Jinnah also asked the *Nizam* of the State of Hyderabad and the United States to not only lend to the infant country but also and invest in it. The second part outlines the commercial, industrial, aviation and employment policies laid down by him. However, the most important economic achievement under his leadership was the establishment of the country's central bank—the State Bank of Pakistan. To conclude the economic management of the country under the visionary leadership of the Quaid was full of promise for a nascent economy that had only begun to toddle. (*Saba Anwar*)

K. M. Nabiul Islam. *Impacts of Flood in Urban Bangladesh: Micro and Macro Analysis.* A H Development Publishing House and Community Development Library, 2006. 224 pages. Paperback. Rs 495.00.

This book deals comprehensively with typical losses from frequent floods in Bangladesh, both at micro and macro levels. The book aims at showing the non-agricultural impact of frequent floods in Bangladesh. The author has thoroughly discussed the occurrence of the different forms of floods and the impact that these had generated in urban areas.

The book examines the impact of different types of floods on the residential and commercial sectors of Bangladesh. The impact has also been examined for different socioeconomic groups. The book is of special use to the water and regional authorities responsible for assessing the impact of floods at the micro and macro levels. The knowledge of the possible damages from floods will contribute towards rational allocation of resources in the flood-prone economy of Bangladesh. Moreover the information on flood hazards, available in the book, can be used for mitigating the damages typically caused by floods. The knowledge of the vulnerability of the various sectors and properties may eventually contribute to targeting of investment towards flood protection and suitably modifying land use regulations. The book is expected to contribute towards mitigating the effects of floods through proactive management. (*Hafiz Hanzla Jalil*)