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Financial sector reforms and household savings in Pakistan: An ARDL approach

Rana Ejaz Ali Khan^{1*} and Qazi Muhammad Adnan Hye²¹Department of Economics, Islamia University of Bahawalpur, Pakistan.²Institute of Business Management (IoBM), Karachi, Pakistan.

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The study empirically examined the relationship between the financial sector reforms and household savings in Pakistan by applying the ARDL cointegration technique on annual time series data for the years 1988 to 2008. Empirical findings indicated that the financial liberalization index negatively created an impact on the household savings in the short-run, as well as in the long-run, suggesting that financial liberalization slid down the savings instead of enhancing it. Policy-makers should not rely on financial reforms to augment household savings. However, per-capita income, agriculture sector GDP and remittances positively affected the household savings in the short-run, while the real deposit rate negatively affected the household savings in the long-run. It is important for the country to maintain high growth rate for the increasing per-capita income which would contribute in enhancing household savings. As such, the growth of the agriculture sector and remittances should also be a part of the policy. Nonetheless, the dependency ratio also negatively affected the household savings in the short-run.

Key words: Financial reforms, household savings, deposit rate, financial liberalization, Pakistan, ARDL.

INTRODUCTION

Pakistan adopted the policy of financial sector reforms on the advice of the International Monetary Fund (IMF) and The World Bank. The main purpose of the reforms was to speed-up the economic growth through increased capital productivity, lowered cost of intermediation by competition, boosted efficiency and enhanced savings. The reformed financial system was expected to assist domestic resource mobilization. In the late 1980s, the process was started and the IMF and World Bank provided technical and financial assistance¹. The mechanics of financial liberalization in this crux of financial reforms

existed in the 1970s. In the earlier studies, McKinnon (1973) and Shaw (1973) focused on the problem of financial repression in developing countries. They found that financial liberalization policies would increase savings and it may spur investments and economic growth where the negative real interest rate would cause a decline in the savings resulting into low investment and ultimately low economic growth.

The findings supported the endogenous growth literature that emphasized the role of developed financial market for higher economic growth through increased productivity of capital and enhanced saving rate. Savings emerged as the basic ingredient by which the financial sector liberalization spurred economic growth². The growth theories of Romer (1986), Lucas (1988) and Jappelli and Pagano (1994) explained that steady growth path is achieved from three dimensions, that is, the level of technology, the level of savings and the proportion of savings channeled into the investment. The financial sector

*Corresponding author. E-mail: ranaejazalikhan@yahoo.com.
Tel: +92 62 9255456. Ext: 433. Fax: +92 345 8724744.

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¹ The World Bank provided a loan of \$350 million during 1989 and 1997 for Financial Sector Adjustment. Pakistan also received \$216 million for financial development and intermediation project in 1995. Another loan of \$300 million was received in 2001 for financial sector restructuring and privatization project. Asian Development Bank also assisted under the capital market development program in 1997.

² However, structuralists and neo-Keynesians are of the view that financial liberalization results into economic growth and increase in inflation. In this case financial liberalization cause interest rates, manufacturing costs and prices to rise.

reforms may enhance growth from these three dimensions. To consider the role of financial sector reforms in economic growth in the long-run, it is crucial to examine the link between financial sector reforms and savings. The core of the current study is to empirically investigate the impact of financial sector reforms on the household savings by using auto regressive distributive lag (ARDL) cointegration procedure.

Literature review and conceptual framework

A number of studies have empirically investigated the relationship between financial reforms, real interest rate and savings. The results vary, possibly due to the analytical techniques, varying data sets and variables defined (Masson et al., 1998), but it may particularly be due to the differing socioeconomic structure, sectoral composition of the economies, the economic situation of the country at the time of reforms and the household and public sector institutional behavior of the nations. For instance, for a sample of fourteen Asian developing economies, Fry (1995) empirically concluded that real interest rate positively determines the national savings, but Schmidt-Hebbel et al. (1992) showed statistically, an insignificant effect of real interest rate on savings. Moreover, Masson et al. (1998) proved that the real interest rate affects private savings positively in industrial countries, but negatively and insignificantly in developing countries. For the effect of financial liberalization on savings, Loayza and Shanker (2000), in India, demonstrated that the savings rate is negatively associated with financial liberalization and dependency ratio, while it is positively associated with income, inflation and fiscal policy. Using panel data of OECD countries, Jappelli and Pagano (1994) examined the role of capital market imperfections on aggregate savings and economic growth. They concluded that financial deregulation had decreased national savings and growth rates. On the other hand, Ahmed (2007) concluded that financial liberalization index is positively related with savings rate, per-capita income and investment in Botswana. Bandiera et al. (2000) constructed an index of financial liberalization for Chile, Ghana, Indonesia, Korea, Mexico, Turkey and Zimbabwe for the period of 1970 to 1994. The relationship between financial liberalization index and savings were found to be mixed, that is, negative for Korea and Mexico and positive for Turkey and Ghana. Moreover, they rejected the positive effect of the real interest rate on savings in most of the countries. Similarly, Agrawal et al. (2009) have found the effect of real interest rate on savings rate to be positive for Bangladesh and Nepal and negative for India and Pakistan.

A panel study by Loayza et al. (2000) show that financial liberalization has adverse impact on private savings along with dependency ratio, while income inflation and fiscal policy have a positive impact on the savings rate.

Chowdhury (2001) estimated a savings function to evaluate the impact of various determinants of private savings in Bangladesh, with special emphasis on financial reforms. For this purpose, the principal components of the matrix were constructed and then the financial reform index was estimated. The index includes the five largest principal components and represents the higher value for more reforms (Bandiera et al., 2000; Ahmed, 2007). Nair (2004), for India, concluded that financial liberalization index is negatively associated with household savings and as such, financial reforms lead to consumption rather than savings. Baharumshah and Thanoon (2007) for Malaysia have also analyzed the relationship between private savings and foreign direct investment and found a positive correlation between them.

Savings behavior (private and total) of the individual countries of South Asia that is, India, Pakistan, Bangladesh, Sri-Lanka and Nepal was analyzed by Agrawal et al. (2009). The study suggested that instead of focusing on interest rate policy to generate higher domestic savings, policy makers should focus on providing banking facilities to every one, especially in rural areas and other regions lacking adequate access to formal institutions. Moreover, greater use of foreign savings (capital and deficit) can reduce savings and it needs to be controlled, especially if it is due to increase in imports of consumption goods. Same trend is also seen in the situation with public savings affecting private savings.

Majority of the studies on the financial sector reforms, relevant to savings, focused on pooled time series cross-sectional data in a number of countries³. However, savings behavior has considerable variation across countries depending on their socioeconomic structure. One cannot be sure whether the results of such pooled studies, are applicable to the average country in the sample. The cross country regression analysis, based on the assumption of socioeconomic homogeneity among countries, is not appropriate. Given the vast differences among countries with respect to structural features, institutional aspects and the quality of data, cross-country comparison and estimation was hampered with danger. It is evident therefore, that specific country studies are important. For Pakistan empirical studies, doing a systematic analysis of the financial sector reforms on savings are rare. As such, the impact of the financial sector reforms (measured through financial liberalization index) on household savings rate will be examined. Before going to the formal model specification of the impact of

³ See for instance, Jappelli and Pagano (1994) for OECD, Fry (1995) for East Asia, Faruqee and Hussain (1995) for Asian countries, Held and Uthoff (1995) for Latin America, Schmidt-Hebbel et al. (1996) for selected developing countries, Masson et al. (1998) for selected developing economies, Bandiera et al. (2000) for a group of countries, Loayza et al. (2000) for a group of countries, Lopez et al. (2000), Agrawal (2001) for East Asia, Baharumshah et al. (2003) for saving behavior in Asian economies, Mohan (2006) for saving behavior of a group of countries having different income level and Ramajo (2006) for saving behavior of OECD countries.

impact of financial sector reforms on household savings, it would be useful to establish how savings was linked with financial sector reforms.

Financial sector reforms involve the elimination of credit controls, deregulation of interest rate, easing of entry into the financial services industry, development of capital market, increased prudential regulation and supervision and liberalization of international capital flows (Hye and Wizarat, 2010). Theoretically, financial reforms enhance the efficiency through which saved resources are channeled into productive use, although the effect on the quantity of savings is unsettled. The influence on savings includes both long-term and short-term effects. A reformed financial system is typically characterized by improved saving opportunities, including higher deposit rate, a wider range of savings media with improved return-risk characteristics and many cases of more banks and bank branches, as well as other financial intermediaries (improved operational efficiency). As such, bank lending rate becomes typically high for those borrowers who had privileged access in the restricted regime, but access to borrowing becomes wider. The long-term effects of reforms on aggregate private savings are felt through changes in rates of return and in the degree of credit restrictions. Moreover, if reforms have a favorable effect on the allocation of resources, it generates income that in turn augments savings (improved allocative efficiency).

The process of financial reforms unleashes a series of short-run effects. One of them is the domestic portfolio adjustment that may not only lead to transitory changes in the volume of domestic savings, but may also induce large capital inflows mostly, but not exclusively attributable to a return flow of past flight capital. If not sterilized, such inflows can result in a credit boom leading to real income surge, which in turn have a direct, but transitory effect on the volume of savings. Modeling of the effect of financial reforms on savings needs to take account of these short-run effects, as well as the long-run effects. It is also important to recognize that some of the overall effects can come through the effect of income on savings. We have included the financial liberalization as an explanatory variable to check the impact of financial sector reforms, along with supporting variables of real deposit rate, per-capita income, dependency ratio, agricultural sector GDP and remittances on household savings.

MODEL SPECIFICATIONS

Generally, to see the effects of financial reforms on different sectors of the economy, the impact evaluation of financial liberalization is done by researchers through dummy variables of pre- and post-liberalization periods (de Melon and Tybout, 1986). An alternative may be to specify a linear trend reflecting gradual liberalization (Muellbauer and Murphy, 1993). Some studies have employed proxy variables like volume of consumer credit (Jappelli and Pagano, 1994), volume of consumer credit and its interaction with interest rate (Ostry and Lavy, 1995), percentage of home-owners in

certain age groups as a proxy measure of credit constraints (Jappelli and Pagano, 1989), rate of consumer credit delinquencies (Carroll, 1992) and financial depth measured by a ratio of M2 to GDP (Vaidyanathan, 1993). As such, the impact of financial reforms on domestic savings will be estimated using liberalization index through the model based on life-cycle theory.

$$HS_t = \phi_0 + \phi_1 FLI_t + \phi_2 RDR_t + \phi_3 Ln(PC)_t + \phi_4 Ln(DPR)_t + \phi_5 Ln(AGDP)_t + \phi_6 Ln(RM)_t + v_{1t} \text{-----} (1)$$

Where, HS_t , FLI_t , RDR_t , PC_t , DPR_t , $AGDP_t$ and RM_t are the household savings, financial liberalization index, real deposit rate, per-capita income, dependency ratio, agriculture sector GDP and remittance, respectively. To capture the effect of the financial sector reforms on household savings, we use financial liberalization index and real deposit rate as explanatory variables. As such, since their model was based on life-cycle theory, we included per-capita income and dependency ratio⁴ as supporting variables. We have also included the foreign remittances and agriculture sector GDP to see the effect of foreign income and structural changes in the economy on household savings⁵. However, household savings, per-capita income, agriculture sector GDP and remittances are measured in million of rupees. The real deposit rate (RDR_t) is taken as the nominal deposit rate (r_t) minus the inflation rate

(π_t) [$RDR_t = r_t - \pi_t$], where inflation rate represents the growth rate of consumer price index. The annual time series data of all these variables for the years 1980 to 2008 has been taken from the State Bank of Pakistan (SBP various years), while financial liberalization index for the same years has been taken from Hye and Wizarat (2010). We employed the autoregressive distributed lag (ARDL) approach to cointegration in order to determine the long-run relationship among the variables. As such, the ARDL cointegration method has the following advantages over the other cointegration techniques. First, the ARDL model gives us the robust long-run results when we work on the small sample size. Secondly, the ARDL approach is applicable whether the primary variables are entirely I (1) or I (0) or mutually integrated. The vector error correction version of ARDL technique is as follows:

$$\begin{aligned} \Delta Ln(HS)_t = & \psi_0 + \sum_{i=1}^n \psi_i \Delta Ln(HS)_{t-i} + \sum_{i=0}^n \psi_i \Delta Ln(FLI)_{t-i} \\ & + \sum_{i=0}^n \psi_i \Delta Ln(RDR)_{t-i} + \sum_{i=0}^n \psi_i \Delta Ln(PC)_{t-i} + \sum_{i=0}^n \psi_i \Delta Ln(AGDP)_t \\ & + \sum_{i=0}^n \psi_i \Delta Ln(DPR)_{t-i} + \sum_{i=0}^n \psi_i \Delta Ln(RM)_{t-i} + \alpha_1 Ln(HS)_{t-1} + \\ & \alpha_2 Ln(FLI)_{t-1} + \alpha_3 Ln(RDR)_{t-1} + \alpha_4 Ln(PC)_{t-1} + \\ & \alpha_5 Ln(AGDP)_{t-1} + \alpha_6 Ln(DPR)_{t-1} + \alpha_7 Ln(RM)_{t-1} + \zeta_{1t} \text{-----} (2) \end{aligned}$$

⁴ We use the dependency ratio as the ratio of the dependent age population (age below 15 or above 64 years) to working age population (aged 15 to 64 years) as a reasonable proxy to capture its effect on savings. Other proxy measures of this effect such as the share of the labor force or number of employed in the population suffer serious problems in national surveys due to lack of adequate data on self-employed and on informal sector workers particularly in rural areas. However, Chowdhury (2001) has taken the dependency ratio as the ratio of the difference between total population and the employed labor force to total population.

⁵ Muhleisen (1997); Loayza and Shankar (2000 for India); Ozcan (2000) for the association of these variables.

Table 1. Results of Dickey Fuller generalized least square (DF-GLS) unit root test.

Variable	Level	1 st Difference
FLI	-1.03	-2.99*
RDR	-2.24	-4.56***
Ln(PC)	-1.09	3.15**
Ln(DPR)	-2.71	-2.95*
Ln(AGDP)	-1.84	-5.12***
Ln(RM)	-1.61	3.98***
Ln(HS)	-2.22	-5.76***

*, ** and *** represent 10, 5 and 1% level of significance.

The long-run relationship among the variables is determined by F-deletion test, while the null hypothesis for no-cointegration amongst the variables in Equation (2) ($H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = 0$) is tested against the

alternative hypothesis ($H_1 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 \neq 0$). The no-cointegration hypothesis is rejected if the estimated value of F -statistic is above the upper bound critical value, and in contrast, if the value of F-statistic falls below the lower bound, the no-cointegration hypothesis would be accepted. An inconclusive inference can be drawn if F- statistic falls inside the upper and lower bounds. As such, the study utilized the critical values of the upper and lower bound that is proposed by Narayan (2005) for the small sample size.

EMPIRICAL RESULTS

The Dickey Fuller generalized least square (DF-GLS) unit root test is utilized for the determination of the integration level. The results of the unit root test in the levels and the first differences are presented in Table 1 and they confirm that the null hypothesis is rejected for all the variables at the first difference. It implies that the series is integrated in the first order. The study determined the robustness among the variables by using ARDL approach. As such, a two step producer is employed in order to determine the long-run relationship. In the first step, existence of the long-run relationship is investigated by using the F-deletion test. The short and long-run co-efficients are estimated in the second step, subject to the long-run relationship that was established in the first step.

The estimated F-statistic was found to be 25.36, that is, higher than the upper bound value at 1% level⁶. So, long-run relationship exists and null hypothesis is rejected. The optimum lag order of ARDL is selected on the basis of Schwarz Bayesian criterion. However, the long-run coefficients are shown in Table 2. It shows that household savings is negatively associated with financial

liberalization index (Aron and Muellbauer, 1999 for South Africa; Loayza et al., 2000; Loayza and Shanker, 2000 for India; Nair, 2004 for India). The household savings was found to be negatively associated with the real deposit rate. As such, we have found a positive association between household savings and per-capital GDP (Burney and Khan, 1992 for Pakistan; Jappelli and Pagano, 1994; Layza et al., 2000; Loayza and Shanker, 2000 for India; Agrawal and Sahoo, 2002). It explains that at the household level, the increase in income tends to raise the household savings rate because household saving capacity was increased. At the macro level, the evidence was verified that as countries grow faster, their saving rates increases. Carroll and Weil (1994) rationalize a similar finding arguing that people adjust to consumption habits slowly, which makes savings positively related to the current growth of income. There is an additional channel through which per-capital income can positively affect the savings. Higher incomes raise more households above the subsistence level, below which they cannot save, and as such, make households to be more responsive to change in the deposit rate (Ogaki et al., 1996). It is found that the agriculture sector GDP and remittances expedite household savings positively, while no significant relationship exists between household savings and dependency ratio in the long-run⁷. As such, the short-run coefficients are shown in Table 3. However, the error correction term is significant with the expected sign and it indicates the high speed of adjustment from the short-run fluctuation to the long-run equilibrium (201% discrepancy is corrected each year). We have also determined the stability of the long-run and short-run coefficients by using cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ). As a result, Figures 1 and 2 represent the graph of CUSUM and CUSUMSQ. Both CUSUM and CUSUMSQ confirm the stability of the long-run and short-run coefficients because test statistics are within the bound values of the 5% level of significance.

The result explained that financial liberalization index

⁶ At 1%, the critical value of 4.270 and 6.211 are lower and upper bound values respectively (Narayan, 2005).

⁷ However, the results contradict the findings of Chowdhury (2001 for Bangladesh) and Ahmed (2007 for Botswana).

Table 2. Long-run coefficients of the household savings model.

Variable	Coefficients	T-ratio [Prob]
FLI	-0.21	-2.39 [0.04]
RDR	-0.02	-2.42 [0.04]
Ln PC	0.24	2.80 [0.02]
LnDPR	-0.14	-0.19 [0.85]
LnAGDP	25.91	5.48 [0.00]
LnRM	0.23	2.83 [0.02]
Constant	5.27	0.52 [0.61]
R^2		0.99
\bar{R}^2		0.99
F-stat		243.65 [0.00]
DW-statistic		2.96

Dependent variable: Household saving (HS).

Table 3. Short-run coefficients of the household savings model.

Variable	Coefficients	T-Ratio [Prob]
ECM(-1)	-2.01	-10.47 [0.00]
(FLI)	-0.41	-2.25 [0.04]
(RDR)	-0.02	-1.39 [0.18]
(LnRM)	0.15	1.29 [0.21]
(LnAGDP)	23.39	2.31 [0.03]
(LnDPR)	-75.17	-2.34 [0.03]
(Ln PC)	0.86	0.17 [0.85]
Constant	10.5622	0.52 [0.608]
R^2		0.95
\bar{R}^2		0.84
F-stat		11.37 [0.00]
DW-statistic		2.97

Dependent variable: Household saving (HS).

depress the household savings in the short-run, as well as in the long-run (Loayza and Shanker, 2000 for India; Loayza et al., 2000 for panel data; Nair, 2004 for India). This is contradictive to the conventional wisdom, based on the McKinnon-Shaw (1993) hypothesis that financial reforms lead to effective savings mobilization and a more efficient resource allocation process, by reducing intermediation spreads, financial deepening and enhanced access to credit. The depressing impact of financial liberalization on household savings suggests that liberalization may have not weakened credit or liquidity constraints. Explaining the adverse effect of financial liberalization on household savings is important for a number of reasons. First, if financial liberalization has led to a reduction in household savings and thus potential growth, then some components of liberalization would have to be reversed to achieve potential growth. Secondly, given the adverse effect of the financial sector reforms on household savings, it can be argued that

macroeconomic management has been difficult and volatile. Thirdly, understanding the cause behind the negative impact of reforms on household savings is important in the perspective that if it is due to consumption boom and an increase in asset prices, the sustainability of the current account would be a matter of concern.

The adverse effect of the financial sector reforms may be explained as the financial liberalization creates an impact on the amount of credit available through the formal financial sector; but in a country like Pakistan, where the agriculture sector is dominant for labour absorption and the rural population is two-third of the total population, the household sector may be insensitive to financial liberalization. In the country, the informal financing in rural communities is prevalent, while financial liberalization affects the formal sector. Secondly, the increased household access consumer credit in the period under study which might have worked to reduce household savings rather than increasing them. Thirdly,

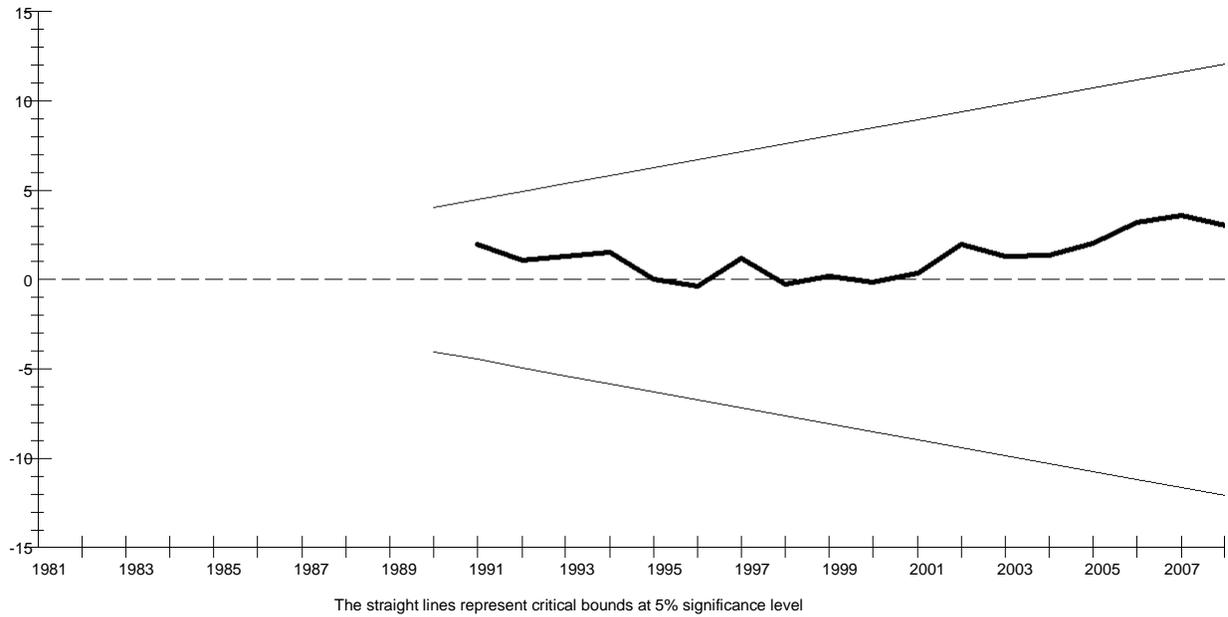


Figure 1. Plot of the cumulative sum of recursive residuals.

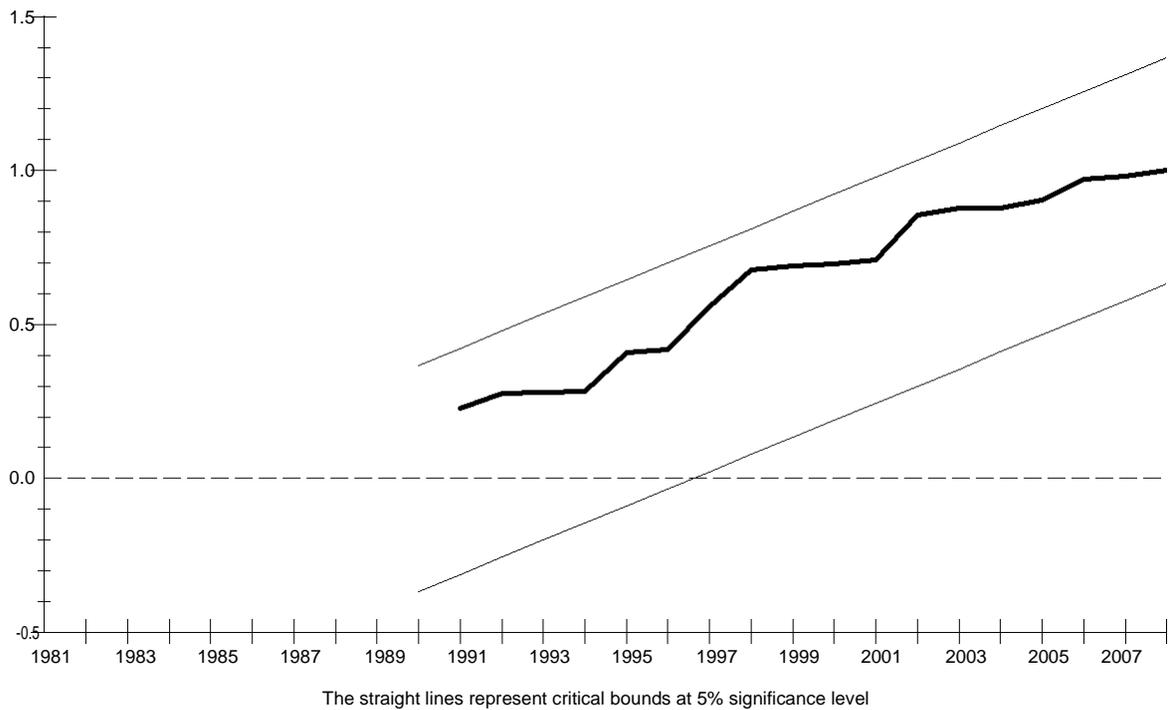


Figure 2. Plot of the recursive residuals' cumulative sum of squares.

Pakistan has experienced, decadelly, real assets booms and household savings which may have been very sensitive to rate the return on investment in real estate. Since increase in real wealth has a negative impact on savings, an increase in wealth, *ceteris paribus*, reduces

savings, as consumption out of income can now be permanently higher. The weaknesses in the banking system have also attributed to the adverse impact of the financial sector reforms on household savings. They may include large non-performing loans, high spread to cover

provisioning and management costs, low loan recovery rates, poor governance and limited capacity of central bank to perform its regulatory and supervisory activities.

The results show that dependency ratio negatively affects the savings in the short-run, which conform to the life cycle theory (Loayza et al., 2000; Loayza and Shanker, 2000 for India). For Pakistan, the finding is supported by Burney and Khan (1992) and Agrawal et al. (2009). The high population growth is the factor behind the phenomenon, along with an increase in the average age. In fact, the country is passing through the transition where fertility rate is declining, although at a slower rate, and death rate is decreasing. It is found that the agriculture sector GDP and remittances positively affect the household savings in the short-run as well as in the long-run. It explains the notion that in the economy, the largest sector which contributes towards GDP and exports in agriculture and which absorb the highest ratio of labour force, has the tendency to save (Chowdhury, 2001 for Bangladesh; Agrawal et al., 2007 for South Asia). The dominance of the agriculture sector in the economy and the agriculture GDP's positive impact on household savings explains that agrarian people save in order to cope with the income instability. The result is supported by Burney and Khan (1992) who concluded that the rural households in Pakistan have higher propensity to save. In rural areas, the banking services are rare and our earlier results have shown adverse impact of the financial reforms on savings. So, access to banking services or returns from bank deposits are not the incentives for rural households to increase savings, but the factor behind this is to cope with income instability. It is further strengthened by the fact that in rural communities, crop insurance programs and health and employment insurance are virtually lacking and as such, the informal sector is prominent.

Theory predicts that greater uncertainty should increase savings as risk aversion consumers set aside resources as a precaution against possible adverse changes in income (Skinner, 1988). Almost two-third of the population that lives in rural areas, facing less opportunities of investment, particularly of small investments, have the only option of savings, although the savings are sometimes consumed in social events like marriages and may be invested in agriculture in the long-run. Edward (1996) provided the empirical support that rural households save a greater fraction of their income. It is further found that foreign remittances contribute positively towards household savings. At the household level, the foreign remittances increase the saving capacity of the household. For instance, when a member of a household is working in a foreign country, the household saves and after returning to his home country, the person makes the investment. For poor households, this saved amount may be utilized for marriages, house construction or purchase of real assets.

Conclusion

The objective of the paper was to capture the impact of the financial sector reforms on household savings in Pakistan. We used the cointegration technique (ARDL) proposed by Pesaran et al. (2000). The ARDL approach confirmed the long-run relationship and indicated that the financial liberalization index and real deposit rate negatively create an impact on the household savings. On the other hand, per-capital income, agriculture sector GDP and remittances positively affect the household savings in the long-run. As such, the dependency ratio has shown an insignificant effect. In the short-run, the financial liberalization index and dependency ratio negatively affect the household savings, while the agriculture sector GDP positively affects the household savings.

The empirical results for the long-run reject the McKinnon and Shaw hypothesis in the case of Pakistan. Policy makers of the country were of the view that financial reforms may increase credit availability and financial intermediation that ultimately would enhance savings. Empirically, the negative impact of financial liberalization index on household savings suggests that financial liberalization had not increased household savings. However, the level of savings in Pakistan is attributed to economic growth, agriculture sector growth and remittances. As such, the dependency ratio negatively affects the household savings in the short-run. The policy makers should not rely on financial reforms to stimulate growth through higher levels of savings; however, the possibility of applying at least loan-able funds for non-productive use exists. They should stress on other areas to increase the level of savings in the country. It is important for the country to maintain higher growth, thereby increasing per-capital income which would contribute to household savings. Nonetheless, the growth of the agriculture sector may be the part of the policy that enhances domestic resources.

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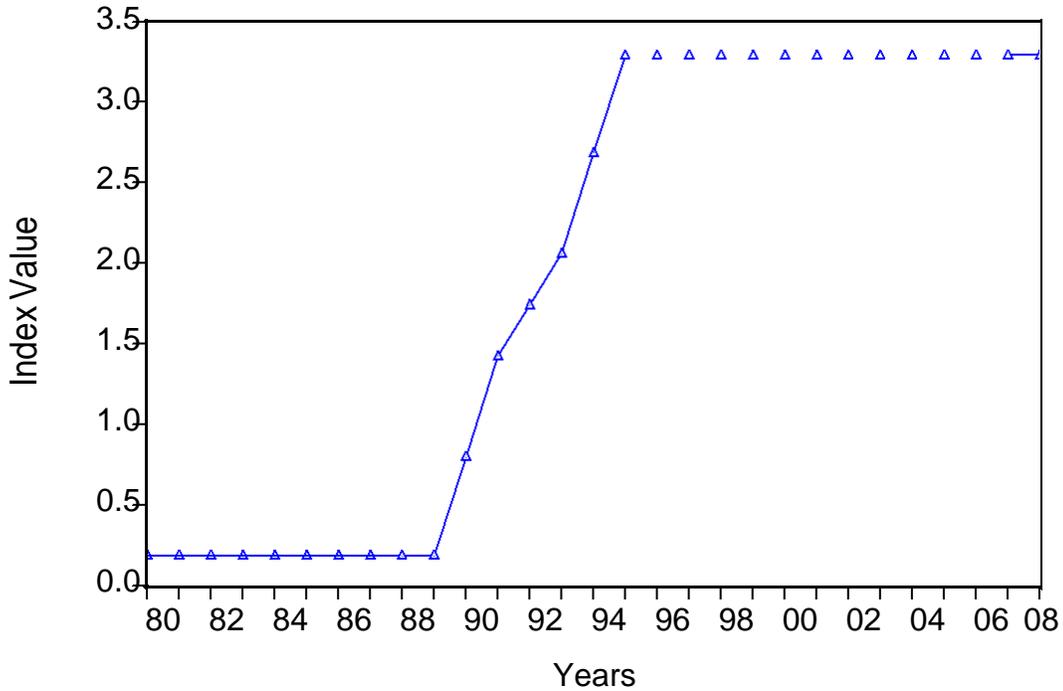


Figure 1. Financial liberalization index for Pakistan. The liberalization measures were adopted in Pakistan during 1990 to 1996.

APPENDIX

Financial liberalization index

We used the financial liberalization index (Figure 1) constructed by Hye and Wizarat (2010). They generated it following the methodology of Bandiera et al. (2000) by using eleven financial liberalization policy components of financial reforms in the country. They were (1) islamization, (2) interest rate deregulation, (3) credit controls, (4) stock market reforms, (5) prudential regulations, (6) privatization of financial institutions, (7) removal of entry barriers, (8) non-performing loans, (9) external account liberalization, (10) debt management reforms and (11) open market operations.

Unit root test

In order to test for the stationarity of the variables, we employed Dickey Fuller generalized least square (DF-GLS) ⁸ unit root test in order to determine the integration level. Elliot et al. (1996) enhanced the power of ADF test by the de trending criteria and DF-GLS test which is based on null hypothesis $H_0: =0$ in the regression (of variable X_t) as follows:

$$\Delta X_t^d = \delta^* X_{t-1}^d + \delta_1^* \Delta X_{t-1}^d + \dots + \delta_p^* \Delta X_{t-p+1}^d + \eta_t \text{-----(1)}$$

Where, X_t^d is the de trended series and the null hypothesis of this test is that X_t has a random walk trend, possibly with drift as follows.

$$X_t^d = X_t - \hat{\varphi}_0 - \hat{\varphi}_1 t \text{----- (2)}$$

Actually, two hypotheses are proposed, that is (i) X_t is stationary about a linear time trend, (ii) It is stationary with a non zero mean, but with no linear time trend. Considering the alternative hypotheses, the DF-GLS test is performed by first estimating the intercept and trend utilizing the generalized least square technique. This estimation is investigated by generating the following variables' subject:

$$Y = [X_t, (1-\beta L)Y_2, \dots, (1-\beta L)Y_t] \text{-----(4)}$$

$$\bar{X} = [X_t, (1-\beta L)X_2, \dots, 1(-\beta L)X_t] \text{-----(3)}$$

Where, T stands for number of observations of X variable and is fixed, while OLS estimation is followed by the equation.

$$Y_t = (1, t)\bar{\beta} = 1 + \frac{\alpha}{T} \text{-----(5)}$$

⁸ Due to less consistency of ADF for small size data, DF-GLS test of unit root is used.

$$\bar{X} = \varphi_0 \bar{Y} + \varphi_1 Y_t + \varepsilon_t \text{ ----- (6)}$$

The OLS estimators φ_0 and φ_1 are utilized for the removal of trend as X_t is high. ADF test is employed on the transformed variables by fitting OLS regression⁹.

$$\Delta X_t^d = \lambda_0 + \rho X_{t-1}^d + \sum_{j=1}^k \gamma_j \Delta X_{t-j}^d + u_t \text{ ----- (7)}$$

In the alternative hypothesis, $\lambda_0 = -7$ in the required equation of (7), then they calculate $X_{td} = X_t - \lambda_0$, fit the ADF regression on new transformed variables and employ the test of null hypothesis that is $\lambda_0 = 0$.

⁹ For the critical values (See Elliot et al. 1996) of null hypothesis that is $\lambda_0 = 0$.