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Demographic Transition and Saving Rates in Pakistan

Atif Khan Jadoon[1], Munawar Iqbal[2], Muhammad Imran[3], Assia Riaz[4]

Abstract

Pakistan is one of the developing countries with a more significant percentage of the working age, i.e., between 14 and 59. When a country has more young people than old ones, it can grow faster than those that have a large number of older people than young people. Economists consider this an opportunity for countries to grow at a higher rate and introduce the term 'demographic dividend' that narrates a phase in which young people (working age population) are in more significant proportion than the dependents. Pakistan's 'demographic dividend' duration is estimated from 1985 to 2045. This scenario in the case of Pakistan has important implications for the labor market, where the labor force can contribute positively to increasing the country's growth rate. An increase in the volume of savings is an essential path through which the labor force can positively contribute to the country's economic health. The present study found out how the age structure of the labor force affects savings in Pakistan. The study showed an inverted U-shaped relationship between age structure and savings. The present study has also suggested some policies to reap the maximum benefits of the age structure in Pakistan.

Keywords: Demographic transitions, Gross savings, Life-cycle consumption theory, Working age population

1. Introduction

The world is changing rapidly, and the role of population age structure can be very crucial for the economic growth of a country. Every country has experienced or will experience an increase in the working age group that can result in more production. The increase in the working age can positively affect the economy, known as the demographic dividend (Kinugasa & Mason, 2007; Ali, 2022). These gains can be in the form of increased labor supply, more savings, and human capital. The saving rate can play a significant role in the economic growth of a country. The present study is an attempt to check the effect of different working-age populations on the economic growth of Pakistan.

The demographic transition mechanism increases by the working-age population due to decrease death rates and health facilities. The increase in the working-age population has opened windows of opportunities for many developed and developed countries to reap the maximum benefits of this Demographic transition inform of demographic dividends. Bloom and Williamson (1998) first introduced the demographic dividend term while studying the economic gains of the increased working-age population in the East Asian region. Later on, Durr-e-Nayab (2008) discussed that *demographic dividends* could be defined as economic gains due to the change in the population's age structure during the demographic transition.

Demographic dividends can increase the development process of a country through three channels, i.e., increased labor supply, increased saving level, and human capital formation. In a demographic transition period, the supply of labor increases due to the fall in population growth in the present and higher population growth in the past (Durr-e-Nayab, 2008; James, 2008; Ali, 2022). In this way, the women's participation rate also increases, ultimately increasing the country's economic growth. The increase in the labor force participation rate directly contributes to the saving rate. In this way, due to demographic transition, labor supply increases, which increases the saving rate. There exist two-way relationships between saving rate and economic growth. Many researchers have established that higher saving rates positively affect economic growth and vice versa. According to Ribaj and Mexhuani (2021), a country with higher saving rates grows faster than a country with a low saving rate. Saving also plays a vital role for a country at micro and macro levels.

The concept of consumption saving behavior framework was given by Modigliani (1970) by presenting the idea of the Lifecycle hypothesis. He explained how a person's income is consumed and saved in the total life span. In the initial stages of life, people tend to consume more or dis-save. In the middle stage of life, people consume less and save more (by working more) for the later stages of life, and in the last stage, they tend to consume more and use accumulated savings. In this regard, A. S. Deaton and Paxson (1997) concluded that people save between 40 and 65 as they do not have to spend much on their children and usually save for the after-retirement period. In the middle stages of life, people become more experienced and professional, which compels them to work more and save for after retirement period. In literature, many studies have highlighted that the capacity to save increased for an individual in the Middle Ages. Health status plays a significant role in increasing savings and maintaining a better lifestyle (Lee, Mason, & Miller, 2003; Ali, 2022). Moreover, when an individual enters the middle ages, his/her saving rate increases which causes more capital formation in the country. One more critical factor that affects the saving rate is the dependency burden.

[1] Corresponding Author, Department of Economics, University of the Punjab Lahore, Pakistan
[2] College of Statistical Sciences, University of the Punjab Lahore, Pakistan
[3] Ministry of Federal Education and Professional Training, Islamabad, Pakistan
[4] Institute of Social and Cultural studies, University of the Punjab, Pakistan

A nation with a higher age dependency rate is less likely to have more savings as most of the savings go for the care of those older people in the household. According to Guest and McDonald (2001), the active labor force tended to save less in the middle ages in the presence of elderly persons dependent on them.

Similarly, Modigliani (1970) discussed in the life cycle hypothesis that saving decreases with age and due to age dependency. The lifecycle profiles are constructed for individuals but not for households. In this regard, A. S. Deaton and Paxson (1997) concluded that there exists a hum-shaped graph while studying the age-saving profiles of the people in Taiwan. According to Durr-e-Nayab (2008), at the micro level savings helps individuals to maintain a good stand of living, and at the macro level, savings help to increase investment and economic growth.

The saving rate in Pakistan is relatively low relative to its neighboring countries. More interestingly, the saving rate is decreasing over time. The following graph shows the overall saving behavior of Pakistan in the last decade.

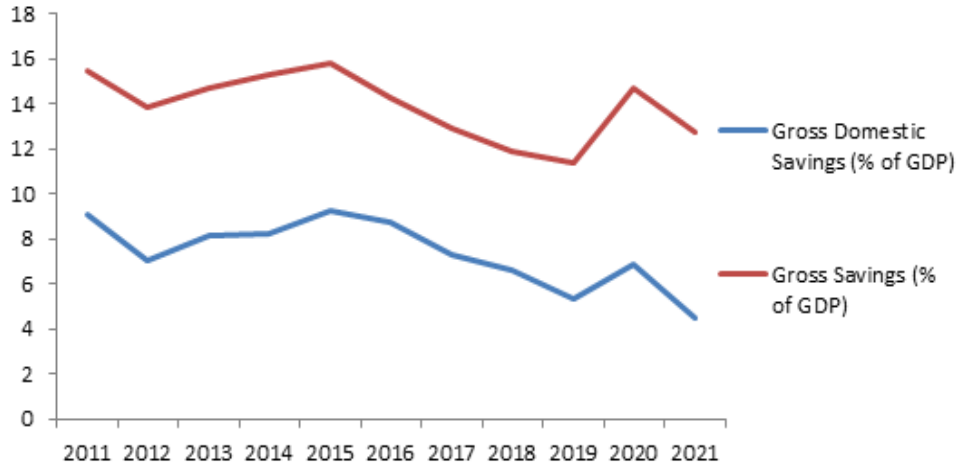

Figure 1: Saving Trends in Pakistan

Source: Authors own constructed graph by using data from World Bank Indicator

Figure 1 illustrates that over the period saving rate decreased significantly. At the start of the last decade, the gross savings were 9.11% of GDP which decreased to the level of 4.52 % of GDP. A similar trend can be seen for the Gross domestic savings. Only one slight increase was seen in 2020, and the primary reason for the slight recovery was an outbreak of Covid-19 in Pakistan. The population of Pakistan is 212.8 million, the sixth largest in the world. The share of the working-age population (15-64 years) increased significantly in the last three decades. The share of the working-age population was 52 % in the 1990s, which increased to 59 % in 2006 (Durr-e-Nayab, 2008). According to the Economic Survey of Pakistan (2016-17), 61.4 % of the total population is in the age group of 15-49 years. The saving rate increases with the increase in a country's working-age population, which also leads to an increase in the well-being of the community at large (Ahmad, Atiq, Alam, & Butt, 2006; Ali and Ahmad, 2016; Ali and Bibi, 2017; Iram and Ali, 2018; Ali and Senturk, 2019; Senturk and Ali, 2021).

The present study is explorative as it tries to check the impact of population age structure on saving in Pakistan. The present study is rare as Pakistan is now at a critical point in its demographic transition. A demographic dividend is time specific window of opportunities for countries, as it does not last forever. The demographic bonus period is a phase in which the working-age population in their productive age significantly contributes towards the economic growth in the country, and Pakistan is going through this bonus period. This study will check how different age groups, people from 14 to 59, contribute towards savings in Pakistan.

2. Literature Review

The demographic structure can play a vital role in increasing the saving rates of a country. The population increase can have positive and negative effects on the country because as the number of people (especially working age) increases, it leads to an increase in the workforce supply. If the workforce is productive, then it leads to an increase in the country's economic resources, including national savings. On the other hand, a rapid increase in population may have a negative effect if the labor is not productive, coupled with the higher dependency ratio and structural unemployment in the country. One significant study by Kremer (1993) concluded that population growth improved the living standard in China, India, and Europe. The study's results suggested that the population growth rate significantly positively affects the economy through technological development. Similarly, Behrman, Duryea, and Székely (1999) conducted an empirical study to check the relationship between the population's average age and various economic indicators by taking data from 164

countries. The authors took an extensive data set of 46 years, i.e., from 1950 to 1995. The study concluded that economic outcomes in the sample countries vary with the mean age of the population. Moreover, trade policies, financial policies, and macroeconomic indicators play a significant role in the economic outcomes of a country.

The age structure of a country also plays a significant role in determining the country's saving and consumption rate. The importance of age structure and consumption-saving behavior is well elaborated in as life-cycle theory by Modigliani and Brumberg in 1954. Several researchers, including Mason (1987), Horioka (1989), Berg (1996), and Browning and Crossley (2001), conducted empirical studies to test the life-cycle theory. The authors found a strong association between saving and the ages of the people. Similarly, Attanasio and Székely (2000) validated the life-cycle theory using data from Mexico, Peru, and Thailand. The authors concluded that household savings in these countries vary with the age composition of the labor force. The study also stressed the importance of saving while discussing the potential savings due to population growth. However, A. Deaton (1992) found out that savings increases for people belong to all ages (young and old).

Leff (1980) stated that a decrease in the population growth rate also reduces young dependency, which in turn causes to increase in the saving rate. However, at the same time, the saving rate decreases due to a decrease in the population growth rate and population aging. Similarly,Williamson and Higgins (2022) conducted a study on the Asian economies to see how rising fertility affects Asian savings. The study's results showed that youth dependency has decreased since the 1960s in Asia, causing the saving rate to increase. Browning and Crossley (2001) also tested the relationship between the aging population and the saving rate of Japan and Australia. The study highlighted that the rate of aging in Japan is relatively high, while in Australia, it is pretty low. The study results showed that Japan's saving rate has fallen over time due to the high rate of aging while Australia's saving rate has increased due to the low aging population. Another study by Uddin, Alam, and Gow (2016) on Australian economy tested the relationship between saving rates, dependency ratios, and real GDP. The authors have used fully modified ordinary least squares to obtain results. The study's results suggested an inverse relationship between dependency ratios and savings. Similar results were obtained by Athukorala and Tsai (2003) for the case of Taiwan by taking time series data from 1952 to 1999.

Yasin (2007) conducted an empirical study using data from fourteen emerging markets to check the relationship between working for age population and saving rate. The study's results showed that the saving rate decreases with the increase in the age of the population, and prime aged population is saving more than other age group population. Moreover, the results also suggested that saving reduces with the increase in the overall dependency ratio due to the expenditures on the dependents. Similar results were obtained by Bloom, Canning, and Graham (2003) for a group of countries, by Rosado and Sánchez (2017) for Ecuador, and by Salman and Zaib (2012) for Pakistan.

Furthermore, Yoon, Kim, and Lee (2014) analyzed the impact of various demographic variables on the saving rate of OECD countries and Japan, including the population growth rate, life expectancy, and working-age population. The study's results suggested that population growth affects saving negatively while both life expectancy and working age population positively affect saving. In another study, Bloom, Canning, Mansfield, and Moore (2007) highlighted that increasing the retirement age significantly increased the saving rates in a panel of cross countries.

In the case of Pakistan, Ahmad et al. (2006) also empirically tested the nexus between young and old age dependency and savings. The authors used time series data ranging from 1972 to 2003. The study's results highlighted that both young and old age significantly and negatively affect savings in Pakistan. Schultz (2005) critically studied Asian countries using data from 1952 to 1992. The author concluded that changing the age structure does not affect savings in Asian countries. However, in the case of Pakistan, the results showed a strong negative effect of the dependency ratio on national savings when estimation was carried out on data ranging from 1959 to 1988. Siddiqui, Siddiqui, and Niazi (1993) also conducted an empirical study to check the relationship between average dependency and household savings using Household Income and Expenditures Survey (HIES). The study's results also found a negative relationship between average dependency, measured as the number of dependents per earner, and savings. Similarly, Ahmad et al. (2006) also concluded that a negative relationship exists between the overall dependency ratio and household savings.

The literature review suggested that only a few studies on Pakistan's economy have quantified the demographics and gross savings. Most studies have used the total population, working age population, young and old age dependency, life expectancy at birth, and population density as a proxy of demographic variables affecting savings. The present study is unique in that it has decomposed the working population into different age groups and checked the impact of these age groups on saving in Pakistan.

3. Methodology and Data

3.1. Model Specification

Most researchers have used fertility or mortality rates as proxies of demographic changes to see their effect on saving rates. However, these proxies may need to be corrected while observing the effect of demographic changes on the macro level due to their long lags and how they affect population structure and the economy. Due to this issue, researchers have used age structure as a proxy of demographic changes, as comprehensively discussed in the literature review section. The

present study has also devised the following model keeping in view the studies of Lindh and Malmberg (1999), Feyrer (2007), and Liu and Westelius (2017).

$$GSP = \propto_0 + \propto_1 YP + \propto_2 MeP + \propto_3 PP + \propto_4 MiP + \propto_5 MP + \propto_6 OP + \propto_7 INF + \propto_8 I + \varepsilon_t$$

where

GSP = Gross savings as a % of GDP
YP= Young age population from age 15 to 24
MeP = Median age population from age 25 to 34
PP = Prime age population from age 35 to 44
MiP = Middle age population from age 45 to 54
MP= Mature population from age 55 to 64
OP = Old age population from age 65 and above
INF = Inflation rate measured through consumer price index (CPI)
I = Interest rate in percentage

Saving is an injection for the economy and works through a multiplier effect as it affects many macroeconomic indicators of the country. Savings stimulate investment, labor demand, production, consumption, and economic growth. Gross saving is the dependent variable of the present study. The present study is designed to check the impact of the different age structures of the workforce on the gross saving of Pakistan. For this purpose, the working population is divided into six categories, including young, median-aged, prime-aged, middle-aged, mature population, and old age. Interest rate and inflation rate are two control variables taken in this study. Interest rate is a significant determinant of saving. If the interest rate increases saving rate increases, and vice versa. The annual interest rate percentage is used for the present study—inflation rate, another control variable that is measured with the help of the consumer price index (CPI). During high inflation, people tend to save less due to decreased purchasing power (Ahmad et al., 2006; Ali, 2015; Ali and Rehman, 2015; Arshad and Ali, 2016; Ahmad and Ali, 2016; Ali and Naeem, 2017; Ali and Audi, 2018; Audi et al., 2021; Ali, 2018; Audi et al., 2022) .

3.2. Data

The present study has used time annual data from 1985 to 2020 to carry out the study results. The data on gross savings, interest rate, and inflation variables are taken form WDI. The data on the age structure of the labor force is taken from the ILO.

3.3. Methodology

The present study has used time series data for the econometric analysis and applied Autoregressive Distributive Lag (ARDL) approach to obtain the results. The problem of non-stationary always exists in time series data. If non-stationary series are included in the model, the results become spurious. If the data series has constant mean and variance, it shows data is stationary otherwise data series is non-stationary. So to make a non-stationary series a stationary series, the researcher has to take the log or difference of the series.

3.4. Unit Root tests

The present study has used the Augmented Dickey-Fuller (ADF) and Phillip Perron (PP) tests to check the stationarity of the data. One of the significant reasons to take the ADF test to check the stationarity is that it includes higher-order lags to avoid the problem of serial correlation.

3.5. ARDL Approach

The cointegration test has been applied to observe the long-run (LR) relationship among variables after checking the stationarity of the data. The traditional cointegration tests like Johansen and Juselius (1990) have the restriction that variables used in the study must be integrated of order one. Moreover, these tests only have consistent LR results if the study's sample size is small. The results remain inconsistent even if the sample size is increased by using weekly, monthly, or quarterly data. Pesaran, Shin, and Smith (2001) proposed a relatively new estimation method known as ARDL approach of cointegration. ARDL method of cointegration follows a general to specific model approach. ARDL approach is quite suitable for studies where variables are integrated of order zero and one. Moreover, the regression coefficient can be obtained when the optimum lag length is selected then results can be obtained through ordinary least squares (OLS). ARDL method of estimation also adjusts the problem of endogeneity in the model. After checking the stationarity of the data and lag length selection for the model, the next step is to apply the bound test.

$$\begin{aligned}\Delta GSP_t = {} & \Phi_0 + \Phi_1 t + \Phi_2(\mathrm{YP})_{t-1} + \Phi_3(\mathrm{MeP})_{t-1} + \Phi_4(\mathrm{PP})_{t-1} + \Phi_5(\mathrm{MiP})_{t-1} + \Phi_6(\mathrm{MP})_{t-1} + \Phi_7(\mathrm{OP})_{t-1} + \Phi_8 INF_{t-1} + \Phi_9 I_{t-1} \\ & + \sum_{l=1}^{p} \delta_l \Delta GS_{t-l} + \sum_{m=0}^{p} \Psi_m \Delta(\mathrm{YP})_{t-m} + \sum_{n=0}^{p} \Psi_n \Delta(\mathrm{MeP})_{t-n} + \sum_{O=0}^{p} \Psi_o \Delta(\mathrm{PP})_{t-o} + \sum_{q=0}^{p} \Psi \Delta(\mathrm{MiP})_{t-q} \\ & + \sum_{r=1}^{p} \Psi_r \Delta(\mathrm{MP})_{t-r} + \sum_{s=1}^{p} \Psi_s \Delta(\mathrm{OP})_{t-s} + \sum_{u=1}^{p} \Psi_u \Delta(INF)_{t-u} + \sum_{v=1}^{p} \Psi_v \Delta(I)_{t-v} + \mu_t\end{aligned}$$

Vector Error Correction Model (VECM) is applied to check the speed of convergence from short-run (SR) to LR. The equation of VECM for the present study is as follow:

$$\Delta GSP_t = \Phi_0 + \Phi_1 t + \sum_{l=1}^{p} \delta_l \Delta GSP_{t-l} + \sum_{m=0}^{p} \Psi_m \Delta(\mathrm{YP})_{t-m} + \sum_{n=0}^{p} \Psi \Delta(\mathrm{MeP})_{t-n} + \sum_{O=0}^{p} \Psi_o \Delta(\mathrm{PP})_{t-o} + \sum_{q=0}^{p} \Psi_q \Delta(\mathrm{MiP})_{t-q} + \sum_{r=1}^{p} \Psi_r \Delta(\mathrm{MP})_{t-r} + \sum_{s=1}^{p} \Psi_s \Delta(OP)_{t-s} + \sum_{u=1}^{p} \Psi_u \Delta(INF)_{t-u} + \sum_{v=1}^{p} \Psi_v \Delta(I)_{t-v} + \beta\, \mathrm{EC}_{t-1} + \mu_t$$

4. Results and Discussion

It is imperative to check the stationarity of the data before applying any time series estimation technique. Moreover, it is also essential that the maximum order of integration for a series must be one and none of the series be integrated of order two. As discussed in the previous section, two unit root tests, namely ADF and PP tests have been applied to check the stationarity of the data and presented in Table 1.

Table 1: Unit Root Tests

ADF test				
	Level		First Difference	
Variables	t-stat value	Pro. Value	t-stat value	Pro. Value
GSP	-2.875514	0.0588	-6.913244	0.0000
YP	-0.251850	0.9221	-4.397899	0.0014
MeP	2.55752	1.000	-5.288362	0.0001
PP	1.309074	0.9982	-6.868074	0.0000
MiP	1.900264	0.9997	-5.542728	0.0001
MP	1.887724	0.9997	-5.455049	0.0001
OP	-0.619515	0.8532	-3.968444	0.0043
INF	-2.415453	0.1449	-7.253417	0.0000
I	-3.239953	0.0264		
PP test				
	Level		First Difference	
Variables	t-stat value	Pro. Value	t-stat value	Pro. Value
GSP	-3.306950	0.0221		
YP	-0.311213	0.9132	-4.411187	0.0013
MeP	4.847395	1.0000	-5.288362	0.0001
PP	2.914428	1.0000	-6.868074	0.0000
MiP	1.802492	0.9996	-5.499371	0.0001
MP	5.030225	1.0000	-5.759403	0.0000
OP	-0.507812	0.8779	-4.021244	0.0038
INF	-2.496679	0.1249	-7.186486	0.0000
I	-2.201535	0.2093	-4.345117	0.0016

The results of ADF showed that all the model variables are not stationary at the level. Only one variable GSP was stationary at a 6% level of significance. Due to the standard practice of a 5% significance level, we can consider GSP non-stationary. All the variables became stationary when the difference form was used to check the stationarity of the variables through the ADF test. The PP results showed that the GSP variable was stationary at the level, and the rest were non-stationary. No variable in both forms was found integrated with order two. We concluded that there is mix order of integration when checked through both tests. This conclusion paved the way to apply ARDL bound test approach to obtain results.

4.1. Test for Long run (LR) Relationship

The first step is to check the LR relationship among the variables using a bound test. The null hypothesis of the bound test states that no LR relationship exists among variables. The bound test provides the values of the upper bound (UB) and lower bound (LB). If the calculated F-value is greater than the UB, we conclude that a LR relationship exists among the variables. On the contrary, if the calculated F-value is lower than the LB, we conclude that there is no LR relationship. In a case where the F-value is between the LB and UB, we conclude that the results will be inconclusive. Bound test results are given in Table 2.

The results of the bound test estimated the F-statistics with its value of 6.57. The value of F-statistics is greater than the UB values obtained with 95 % and 99 % confidence intervals. Based on the F-value, we can conclude that a LR relationship

exists among variables. After checking the LR relationship among variables, the appropriate lag length is selected. There are two most commonly used methods of selecting optimum lag length: Akaike information criteria (AIC) and Shwarz-Baysian information criteria (SBIC). The present study used the SBIC criterion and found maximum lag length is 3 for the model.

Table 2. Bound Test

F-statistics	Bound Values (99 % confidence interval)		Bound Values (95 % confidence interval)	
	Lower	Upper	Lower	Upper
6.570244	3.74	5.06	2.86	4.01

4.2. Long run (LR) Results

The LR relationships are estimated after obtaining the maximum lag length. The results of the LR are presented in Table 3.

Table 3. Results of the long run coefficients

Variables	Coefficients	Standard Errors	t- stat	Probability values
YP	-0.20536	0.06726	-3.05332	0.004
MeP	-0.245	0.26789	-0.91455	0.425
PP	0.02013	0.24125	0.08344	0.986
MiP	0.1023586	0.58632	0.174578	0.067
MP	0.26356	0.6325	0.416696	0.653
OP	-2.01364	0.75962	-2.65085	0.019
INF	-0.38562	0.19257	-2.00251	0.040
I	0.35256	0.31425	1.121909	0.2931
F-statistics	P-value	R-squared	Adj R-squared	
5.45	0.0010	0.8374	0.6640	

The results of the LR relationship showed that the overall model is a good fit as the p-value is less than 0.05. All the coefficients have expected signs. The result revealed that the young population (YP) coefficient is negative and statistically significant. The negative sign validates the life cycle hypothesis in which it is mentioned that people at early ages tend to consume more than save. At early ages, people usually have less income and sometimes have to borrow (dissaving). The coefficient of the median population (Mep) is also negative as most of the people in Pakistan start their work in this age frame. So in the early stages of the job, people usually spend more and do not save. Workers in the prime age tend to save more, and results also confirmed the positive relationship between prime age and savings but statistically insignificant. The sign of the coefficient is according to the researcher's expectations, and the results align with the studies of Mason (1987) and Kinugasa and Mason (2007). The results also suggested a positive association between middle age (Mip) and their saving rate. The population in this age group saves more, and the results confirmed this hypothesis at 7 % level of significance. Many factors may contribute to this positive relationship, like exposure, education, information, and more than one job at a time. Due to experience, people of this age have more real income than the young population. The result also confirmed the positive relationship between the mature age population and savings, but the relationship is insignificant. The people in this age group have a particular motivation to save more for the after retired life. Our study's old age population (OP) is those above 60. The LR results show that OP negatively and significantly affects gross savings. Due to the average life expectancy effect, people tend to save less at this age. The motive for saving is far less in this age; hence OP saves less for the future. As discussed in the life cycle hypothesis, people consume their savings at this age. The same results were obtained by Horioka (2010) for Japan by using micro and macro-level data. This study concluded that older people either retire or do jobs that consume more. Furthermore, Bloom et al. (2003) also proved the negative and significant relationship between the elderly population and savings. The study concluded that workers who did not save money for the later stages of their life become a burden on the country, and their life depends on the next generation. Inflation and interest rate are two control variables of the model designed to check the impact of age structure on savings. The coefficients of both variables have expected signs. Inflation rates have a negative and statistically significant effect on savings in the LR. The results are in line with the study of Brookins, Ahmad, Ahmad, and Saeed (2015). The results also suggested a positive and significant effect of interest rate on savings in Pakistan.

Overall, the study results showed that the middle age population significantly and positively affects savings in Pakistan. They have to spend rationally to plan their after-retirement life, and these people understand the importance of saving for themselves and the next generation. The model results confirmed the inverted U-shape relationship between age structure and gross savings in Pakistan. The value of R-square, considered an indicator of the model's fit, has a value of 0.83, showing the 84% variations in the savings variable due to the study's independent variables.

4.3. Short run (SR) Results

The results of the impact of age structure on savings in the SR are presented in Table 4.

Table 4. Short run Results

Variables	Coefficients	Standard errors	T-stat	P-values
Young	0.21536	0.0654	3.2929664	0.015
Median	-0.50124	0.28442	-1.7623233	0.148
Prime	0.02436	0.28361	0.0858926	0.943
Middle	1.11986	0.5432	2.0615979	0.066
Mature	-1.57863	0.88745	-1.7788382	0.086
Old	-0.08126	0.46321	-0.1754237	0.932
INF	-0.36214	0.24365	-1.4863123	0.184
IR	-0.40744	0.27389	-1.4876045	0.158
ECM	-0.76352	0.351446	-2.1725101	0.002

The main objective of the SR results is to check the convergence, through Error Correction (EC) term of the gross savings towards its LR equilibrium. The value of the EC term must be negative, less than one, and statistically significant. The results showed that EC is statistically significant at a 1 % significance level with a value of -0.84. The value of the EC term, which is -0.84, shows that cointegration exists among variables and deviation of gross savings from the equilibrium will be corrected by 84% in one year. The results showed that in the SR, YP, PP, and MiP have a positive effect on the gross savings in Pakistan, while the rest of the variables for age structure and control variables (inflation and interest rate) contribute negatively towards gross savings in Pakistan.

4.4. Diagnostic tests results

The diagnostic tests are applied to check the problems of Serial correlation, Heteroscedasticity, Normality, and Autocorrelation. LM test is used to check the problem of serial correlation, the Godfrey test is used to check the problem of Heteroscedasticity, the Jarque-Bera test is used to check the problem of Normality, and Durbin Watson is used to check the problem of autocorrelation. The results are shown in Table 5.

Table 5. Diagnostic Tests

Problem	Tests	F-stat/Chi-sq.	P-values
Serial correlation	LM	14.32610	0.1644
Heteroscedasticity	Godfrey test	2.404591	0.3364
Normality	Jarque-Bera (JB)	1.616292	0.4457
Autocorrelation	Durbin Watson (DW)	1.9803	

The null hypothesis of the LM test, Godfrey test, and JB test states the existence of the problem of serial correlation, Heteroscedasticity, and Normality. The p-values of all three tests are greater than 0.05, which shows the rejection of the null hypothesis in all three tests. All three tests show no problem of Serial correlation, Heteroscedasticity, and normality. The calculated value of F must be between -1.8 to 2.2, which shows the absence of autocorrelation. The F-value, in this case, is 1.9803, which shows the absence of autocorrelation.

4.5. Stability Test Results

Cumulative Sum (CUSUM) and Cumulative sum of squares (CUSUMsq) tests have been applied to check the stability of the parameters in the SR and LR. The obtained lines of CUSUM and CUSUMsq tests must lie within the 5% level of significance bounds showing the estimated parameters are stable. The results of both tests are presented in Figures 2 and 3.

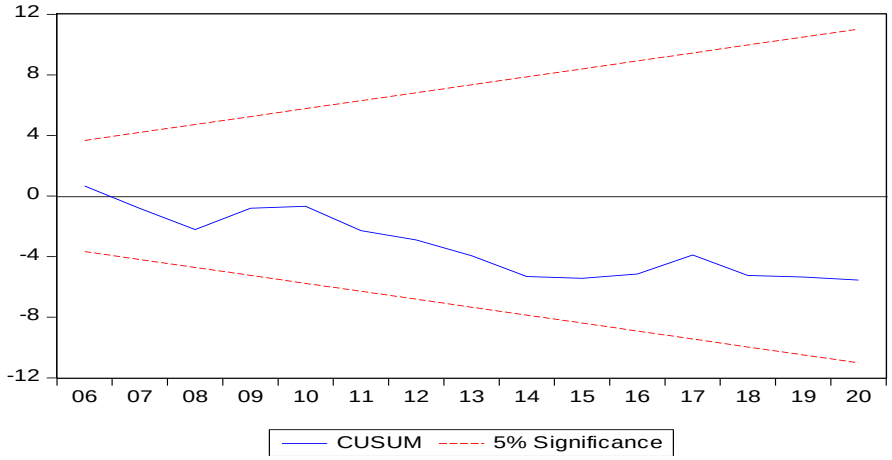

Figure 2: Results of CUSUM Test

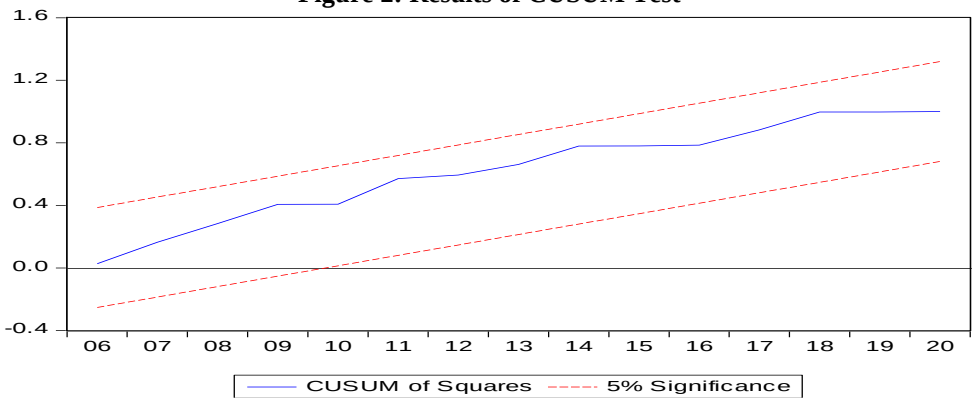

Figure 3: Results of CUSUM-Square Test

The obtained lines of both tests lie within the specified bounds at a 5 % significance level. The results confirm that the SR and LR estimated parameters are correctly predicted, and the developed model for this study is stable and well-specified.

5. Conclusion

The population is an important factor for a country that can positively or negatively contribute towards a country's saving rate. In the case of developing countries, many studies have been conducted to show the relationship between different macroeconomic variables rate and demographic variables proxies by population dynasty, dependency ratios, and working age population. In the case of Pakistan, only a few studies have been conducted to see how demographic variables affect the saving rate in Pakistan. Saving plays a significant role in a country's economic health as it is linked to various macroeconomic indicators. The present study has been designed to fill this gap and see how different age groups of workers contribute towards saving in Pakistan.

The age structure of the labor force (independent variable) has been taken as a proxy for demographic transition in Pakistan. The age structure is decomposed into different age groups where the gap between age groups is ten years. Inflation and the interest rate were taken as control variables. ADF and PP unit root tests were used to check the stationarity of the data. The results of unit root tests provided the base to apply the ARDL approach of cointegration. The LR estimates showed a negative YP, MeP, and OP relationship with the gross saving, while a positive relationship between PP, MiP, and MP and gross saving was observed. The results of SR estimates were almost similar to the LR estimates. The value of the EC term was found negative, less than one, and statistically significant, which showed the gross saving is converging and adjustment is taking place from the SR to the LR. The speed of adjustment was found to be 84% per year as annual data was collected for the present study. The diagnostic tests confirmed no problem with serial correlation, heteroscedasticity, normality, and autocorrelation. The stability tests also showed that SR and LR estimated parameters are stable. The model results confirmed the inverted U-shape relationship between age structure and gross savings in Pakistan.

Pakistan is middle of its demographic dividend period, which is crucial for developing a country. Pakistan needs some labor policies that can be practiced for the next decades before this dividend period washes off. We need to reform our education system, which must be compatible with local and international requirements. Women's participation must be

increased by introducing some incentive to work, and it must be in the public and private sectors. The government must introduce different saving schemes for the young labor force. It is a practice in Pakistan to give special saving rates for older adults, but at the same time, the young population must be treated similarly. Suppose Pakistan needs to properly grab this window of opportunity by providing the right direction by affecting policy implementation. In that case, it is possible that it will take the form of the demographic debt of aging people after some decades.

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