RELEVANCE OF LIFE-CYCLE HYPOTHESIS FOR LOW-INCOME COUNTRY: AN EMPIRICAL INVESTIGATION FROM PAKISTAN

Syed Ammad[1] and Qazi Masood Ahmed[2]

Abstract

This study investigates the nexus between wealth and aggregate consumption, under the lifecycle hypothesis. The study covers annual time-series data from 1973 to 2015 where dynamic-OLS (DOLS) is applied for estimating this nexus for Pakistan. However in order to check the robustness Ridge regression is also applied, which endorse the finding of original estimates. The study results show that MPC out of income is ranges from 0.55 to 0.59, while the wealth coefficient is insignificant with negative sign. Further the age-structure variables i.e. overall dependency and working age dependency ratio both have negative effect on consumption. The overall results refuted the lifecycle conjecture in case of Pakistan, as the wealth has in-significant effect on consumption and dependency ratios have contradictory sign against the lifecycle assertions. The non-existence of lifecycle hypothesis may be, plausibly, due to some distinctive feature of Pakistani society. Such as, the significant negative sign of dependency ratio support our social behavior where old-age people sacrifice their consumption for younger and another motive is bequest which certainly dominates in Pakistani society.

JEL Classification: D10; D12; E21.
Keywords: Aggregate Consumption; Wealth; Lifecycle Hypothesis; Pakistan

1. Introduction:

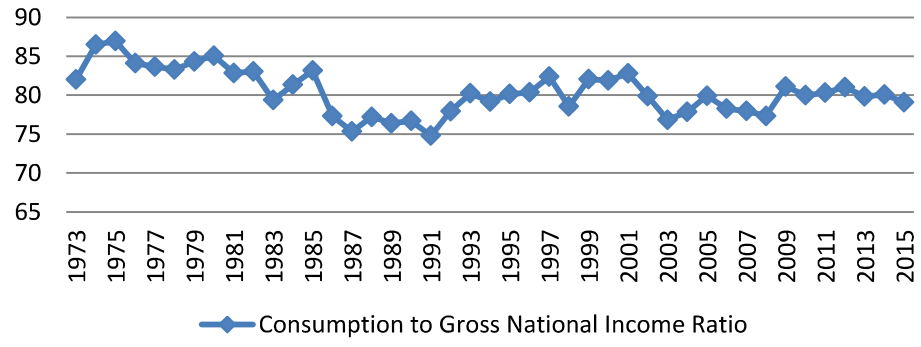
Consumption is one the most important economic variable which is used as a bench mark and proxy to measure different economic and socio-economic characteristics of the society. There is a great deal of

[1]Syed Ammd Ali, Lecturer/Staff Economist Applied Economics Research Centre (AERC), University of Karachi, For comments and information ammadsyed@yahoo.com. This paper is part of my PhD thesis.
[2]Qazi Masood Ahmed; Director, Centre for Business & Economics Research, Institute of Business Administration, Karachi.qmasood@iba.edu.pk.

research contribution in economic literature encompassing various dimensions of consumption related issues. Along with other research themes one of the most important research themes is related to the investigation of determinants of the consumption or the estimation of consumption function. The most articulated theory in this regard is the lifecycle hypothesis (LCH), which emerged after the seminal work of Modigliani in a series of research papers. There are several variant of this hypothesis, in a general sense it claims that the individuals spread their lifetime consumption over their lives by accumulating savings during earning years and maintaining consumption levels after retirement. The outcome of such conjecture is that the consumption is treated as a function of age, where individuals borrow in early ages then save and after retirement, in old ages, dis-save. Another variant of this theory based on the linear association among the variables like aggregate consumption, income and wealth, as discussed by Modigliani and Tarantelli (1975) and Ando and Modigliani (1963).

Pakistani society is also a consumption driven society where more than 75% share of national income belongs to private consumption, as depicted in figure 1.

Figure1: Consumption to Gross National Income Ratio



Despite of its significant contribution in explanation of various economic phenomena, the research contribution related to the estimation of consumption function and other associated issues related to the consumption is relatively scarce in case of Pakistan. The existence of lifecycle hypothesis for low-income and developing economies is still

debated; even in most of the cases these economies do not follow the lifecycle assertions. The present study is an addition in the pool of existing research related to the relevance of lifecycle hypothesis for low-income economies. It is a pioneering attempt to investigate the lifecycle hypothesis in case of Pakistan through aggregate consumption, income and wealth relationship. The present analysis follows the Gali (1990) theoretical formulation of lifecycle model where he assumed a common linear trend among aggregate consumption, income and wealth, since then, the empirical investigation of lifecycle hypothesis is surged toward finding the long-term relationship among these variables through cointegration and error-correction mechanism Davidson *et al.,* (1978).

The remaining sections of the study are organized as follows: section II discusses the past literature, section III contains Analytical Framework, section IV provides an explanation of the data sources and estimation technique, section V provides the basis for the empirical results and finally the conclusion and recommendations are discussed in section VI.

2. Review of Literature

The wealth effect of consumption or saving is extensively examined in case of developing and developed countries as in case of Italy Modigliani and Tarantelli (1975) examined the relevance of different consumption functions, by using aggregate data from 1952 to 1970. In the first fold, study compared the Keynes(1936) absolute-income with Duesenberry(1949) and Modiglian(1949) consumption hypotheses, and then Tillman Brown(1952) and Tom Davis(1952) consumption function by adding lag of consumption as an additional explanatory variable in the Keynesian function, then after Kaldor (1960) consumption function by adding the variable of product of independent labour income(property income) and ratio of disposable income to net nation income in the Keynesian function. Finally, the study estimated the LCH through regressing the aggregate consumption on net worth, proxied by financial wealth, and labour income. The results of LCH model showed that MPC out of labour income was in between 0.59 to 0.78 in different models, while the coefficient of net worth was also align with previous finding i.e. 0.03 to 0.09, this LCH model was also augmented by adding unemployment to incorporate the economic fluctuations. The study

concluded that the augmented LCH is more superior then Kaldor based consumption function.

Mehra (2001) estimated the lifecycle version of consumption by using U.S quarterly data of aggregate real per-capita consumption on non-durables and services, real per-capita disposable labour income and per-capita net worth (wealth) from 1951 to 2000. The study also used another model where net worth is disaggregated into per-capita non-equity net wealth and per-capita equity wealth. The long-term results showed that the coefficient of income and net wealth, in first model, both had positively significant effect on consumption. Tan and Voss (2000) examined the relevance of lifecycle income hypothesis for Australia through quarterly data of real per capita consumption on durable good, consumption expenditures on non-durable goods, wealth and labour income; from 1988:4 to 1999:3. Furthermore the wealth is also disaggregated into financial and non-financial wealth. The study support the lifecycle hypothesis as the estimated results of dynamic OLS and DGLS showed positive wealth effect on consumption and also found the existence of cointegration among consumption, income and wealth.

Fenz and Fessle (2008) estimated the Australian consumption function through cointegration mechanism. The study consist of the quarterly data set from 1988 to 2008 where real log consumption was used as dependent variable while the real aggregate wealth and real household Disposable income were used as explanatory variables. The estimated results proved long run relationship among these variables, while the estimated coefficient of wealth showed that wealth had significant positive effect on consumption and a 1 percent increase in wealth leads to 0.05 5 percent increase in consumption. Similarly in case of Hongkong Cutler (2004) estimated the lifecycle consumption model by using the quarterly data from 1985Q2 to 2000Q4. The estimated coefficient of income, housing and financial wealth were 0.87, 0.03 and 0.02 respectively, which also support the previous finding related to other advance countries.

Sousa (2009) examined the consumption function based on lifecycle hypothesis for Euro area by using quarterly data from 1980:1 to 2007:4. The estimation based on dynamic OLS; through which long-run elasticity were estimated, while for short-run elasticity of these models were estimated in difference form through IV/GMM techniques. Further, the study transformed these elasticities in marginal propensities by multiplying the estimated coefficient of wealth with consumption-wealth ratio. The results also supported the previous finding related to lifecycle

model. In and other study related to Portugal Castro (2007) examined the wealth effect on consumption under the lifecycle model. The estimated results showed that the MPC of net wealth is 0.03 and 0.02 for financial and housing wealth while the coefficient of error-correction term is also significant indicating the existence of long-term relationship.

Many other examined the lifecycle through demographic age structure as in case of India Athukorala and Sen (2004) estimated the determinant of private saving in India under the Life-cycle hypothesis. The estimated results show that growth rate has positive significant effect on average saving, 1 percentage point increases in growth bring 0.15% increases in average saving. However the remaining two life cycle variables i.e. population growth and wealth were not significant. The study concluded that the saving behavior followed the Keynesian absolute-income, as the per capita income has positive significant effect on average saving, in the long run. Ozcan *et al.,* (2003) estimated the effect of policy and non-policy variables on private saving in Turkey during 1968 to 1994. Where older than 65, and life-expectancy were used as a proxy for live-cycle saving behavior. The estimated results related to the life-cycle variables show significant relationship with saving.

In case of China Modigliani and Shi (2004) investigated the Chinese saving puzzle under the LCH. The study formulated the model which based on household average saving, as dependent variable, while long-term growth of 15 years, inflation, dependency ration (total employed person divided by under 14 years population), growth difference of previous year with long term growth and the reciprocal of per-capita income, were used as explanatory variables in different models. The OLS estimated results show that long term growth, growth difference, dependency ratio and inflation all have positive significant effect on average saving, in each model. These finding strongly support the LCH.

Epaphra (2014) estimated the determinant of saving in Tanzania under the life-cycle hypothesis. The magnitude of the variables show that the highest positive effect on growth depend of life expectancy followed by population growth, disposable income, growth rate, and consumption i.e. 8.5, 8.1, 0.82, 0.38, and 0.31 respectively. The author further concluded that positive significant effect of life expectancy and population growth support the LCH. The results of causality show that GDP growth causes the saving but saving do not Granger cause the GDP growth. Keho (2012) investigated the relevance of life-cycle hypothesis for 16 African countries where the causality results show that there is negative causation

between dependency ratio and saving rate in 9 out of 16 countries. Erlandsen and Nymoen (2008) estimated the lifecycle consumption model in case of Norway. The estimated results of the long-run estimates show that elasticity of disposable income and wealth is 0.66 and 0.17 respectively, with high level of significance, while dependency and real interest rates significantly negative effect on consumption. This negative significant impact of dependency ratio endorses the existence of lifecycle consumption hypothesis.

The cross country researches also support the lifecycle as Estrada *et al.,* (2011) examined the consumption under the lifecycle model through old-age dependency in case of 31 Asian countries and these results were further compare with 122 other countries, other than Asian. The estimated results show dependency ratio variables have significant positive effect on consumption, in all the cases; indicating a negative saving effect. Which support the lifecycle hypothesis. Li *et al.,* (2006) estimated the effect of demographic variables on saving, investment and growth. The study comprised on panel data of 200 countries from 1963 to 2004, which was collected with five years interval. The estimated models consist of saving and investment to GDP ratio, growth of population and per-capita income, fertility rate, life expectancy, old-age to middle age ratio and middle-age to total population ratio. The results of country and fixed-effect models showed that demographic variables had significant growth effect. More specifically; longevity had positive effect on saving and investment while dependency and fertility had negative effect on saving and investment.

The review of the existing research stock highlights that in case of Pakistan this sort of researches are scanty, however there are few studies which investigated the determinants of saving by using age-structure variables as Ali *et al.,* (1997), Ahmad (2002) and most recently Brookins *et al.,* (2015). These studies incorporated different demographic variables including dependency ratio of adult (population less than 14 year to total population) and dependency of old (population greater than 65 to total population). The literature also emphasized that the lifecycle hypothesis is more pertinent for advance economies and often in the case of low-income courtiers this hypothesis does not prevail. This is because of several reasons however the common conclusion was that in low-income countries credit markets are not much efficient and people always feel liquidity problems.

3. Analytical Framework

Theoretical Model

One of the basic assertion of the lifecycle hypothesis is that, individuals want to maximize their utility through consumption under the given lifetime resources Ando and Modigliani (1963) and Modigliani and Tarantelli (1975). These resources are the sum of current labour income, future expected labour income and net worth comprises on human and non-human assets. Later on Gali, (1990) proves that following the lifecycle model, under the assumption of lifetime saving in a finite horizon, there is a linear relationship among these variables. i.e. aggregate consumption, wealth and income, in other word these series are cointegrated. Based on these assumptions following generalize consumption function formulated

$$C_t = \propto_0 + \propto_1 Y + \propto_2 W(1)$$

Where C is the aggregate consumption, Y is the labour income and W is the net wealth. The lifecycle behavior ensures that the propensity to consume out of labour income must be less than unity.

Empirical Specifications and Data Issues

This study evolve on the basis of three main variables consumption, labour income and net wealth, all these variables have variety of definitions and components which often change the predicted relationship. The aggregate consumption has different combinations many of the studies based on aggregate consumption included durable, non-durable and services (Cutler, (2004); Epaphra (2014); Avazalipour (2011), and Modigliani and Tarantelli (1975)) many other use consumption on non-durables goods and services Mehra (2001) and Tan and Voss (2000). These definitional differences are mainly due to the availability of the data, as in the case of Pakistan we do not have disaggregated data of private consumption, so this study employed aggregate consumption data.
Another important differential among the research studies arise due to the selection of income variable at aggregate level, different studies employed different variables as a proxy of income. Many authors used GDP as a proxy of labour income including Modigliani and Cao (2004), Samantaraya and Patra (2014); Keho (2012), Epaphra (2014) and Avazalipour (2011). Many other used GNP as a proxy for labour income and in many cases, where the data was available, labour income was

directly used, as Ali *et al.,* (1997), Mehra (2001) and Tan and Voss (2000). Finally, the choice of net wealth variables is also crucial, different studies applied different variables for wealth including housing wealth, financial wealth through capital market capitalization, and property values. However, this situation become more problematic in case of non-availability of data, especially in case of developing countries, different studies used broad money supply or market capitalization as a proxy for wealth Athukorala and Sen (2004), and Samantaraya and Patra (2014). Following the literature and keeping in view the limitations of available data the present study use GDP as a proxy for labour income and M2 and market capitalization as a proxy for net wealth.

Finally, on the basis of existing debate the study formulated following augmented consumption function under the lifecycle hypothesis

$$lnC_t = \propto_0 + \propto_1 lnY_t + \propto_2 lnW_t + \beta Z + \mu_t (1)$$

Where lnC is the log of real per-capita aggregate consumption, lnY is the log of real per-capita GDP, lnW is the log of real per-capita wealth; where real per-capita M2 and real per-capita market capitalization, are used as a proxy, and Z is the vector of other factors included overall dependency ratio[1] and working-age population dependency[2] ratio.

4. Data Sources and Estimation Techniques

Present study based on time-series data from 1973 to 2015. All the data series were taken from the State Bank of Pakistan Annual Reports, 50 Years of Pakistan Economy, and various issues of the Economic Survey of Pakistan. The study converted all nominal variables into real by using the CPI deflator for 2005-06; the common base of 2005-06 deflator series is generated through the standard splicing technique.

The following table-1 presented some basic statistic of the major study variables, which shows that the average per-capita consumption and income are Rs. 24411 and Rs. 29725 respectively. The average per-capita wealth is quite low i.e. Rs. 12692 only. The over-all dependency ratio is 44.89%, however the working age population-dependency ratio is much high 81.85%.

[1] It is the ratio of young age (0-14) plus old age (65+) divided by total population.
[2] Working age to dependency is the ratio of young age (0-14) plus old age (65+) divided by working age population (15-64years).

Table1: Descriptive Statistic of Major Study Variables

Statistic	Per capita Consumption	Per capita GDP	Per capita Wealth	Working age Population Dependency Ratio	Over all Dependency Ratio
Mean	24411.65	29725.76	12692.13	81.85	44.89
Median	9233.09	11630.38	5790.25	87.08	46.55
Std. Dev.	32009.74	38168.84	15755.15	8.37	2.65
Observations	43.00	43.00	43.00	43.00	43.00

In order to estimate the stationarity of the variables and structural break points, if any, the Augmented Dickey-Fuller (1979), Zivot, and Andrews (1992) and Phillips Perron (1988) test are used to check the order of integration. The existence of long-run relationship can be confirmed through several methods including Engle-Granger (1987) single equation method, or through maximum likelihood procedure Johansen (1991, 1992). These techniques are more suitable for large data size and the order of integration is also very crucial for these procedures. However the study variables have different order of integration, which do not allow us to use the preceding methods of cointegration. Coping with this issue we applied Bounds testing approach for cointegration developed by Pesaran and Shin (1995, 2001) and Narayan (2004). The Bounds testing approach is most suitable for small sample size with different order of integration. Finally, Following the preceding literature Tan and Voss (2000), Davis and Palumbo (2001), Mehra (2001), Cutler (2004), Castro (2007), and Sousa (2009) the Dynamic Ordinary-Least-Square (DOLS) technique is applied to find the long-run elasticity and marginal propensity to consume out of income and wealth. The selection of DOLS regression is mainly due to endogeneity, as this technique removes the asymptotic serial-correlation and endogeneity.

5. Results and Discussion:

Unit Root Analysis:

In order to investigate the order of integration of the study variables two major test are applied Phillips Perron (1988) and Zivot, and Andrews (1992). The results of unit root test are presented in table-2 which shows that consumption and GDP ate integrated of order (I) while the all the

remaining variables are I (0). Furthermore to avoid the biased estimation we also applied the structural break unit root test which confirms[1] that there is no structural break in study variables.

Table 2: Phillips-Perron Unit Root Test

		Level		First Different		Order of
Variables	Exogenous	t-Statistic	Prob.	t-Statistic	Prob.	Integration
Log of Real Per capita Consumption	Constant, Linear Trend	-1.76	0.70	-6.43	0.000*	I(1)
Log of Real Per capita Broad Money (M2)	Constant, Linear Trend	-3.99	0.0168**			I(0)
Log of Real Per capita Market Capitalization	Constant, Linear Trend	-3.44	0.0591***			I(0)
Log of Real Per capita GDP	Constant, Linear Trend	-2.71	0.24	-6.21	0.000*	I(1)
Over all Dependency Ratio	None	-2.21	0.0279**			I(0)
Working age Population Dependency Ratio	None	-2.10	0.0355**			I(0)

* Significant at 1%, ** significant at 5%,*** significant at 10%

Cointegration Analysis:

The estimated results of cointegration are mentioned in Appendix-A, table-A1 which shows that aggregate consumption, wealth and income are cointegrated. This model further augmented by incorporating overall dependency, and working age-population dependency. The results of Bounds test confirm the cointegration relationship in each model. Interestingly, when we applied market capitalization, as a proxy for wealth, none of the model shows any cointegration relationship. Hence the long-run estimation just based on the models where M2 is incorporated as proxy for wealth.

[1] For the sake of brevity the results are not reported, but are available on demand.

Long-run Elasticity and Marginal Propensity to Consume:

The estimated results of two different models are mentioned in table-3. The results of model-1 show that a one percent increase in income will increase the consumption by 0.67%, while the marginal propensity to consume[1] out of income shows that a unit increase in income will increase consumption by 0.55 units. The results of model-1 also show that the wealth coefficient is insignificant, which is certainly against the lifecycle theory. The overall dependency ratio in this model is significantly negative; indicating rise in dependency reduces consumption, in other words it will increase the saving which is again contrasting with the lifecycle hypothesis. The Model 2 also has the same divergent results with insignificant and negative wealth effect, while the MPC out of income is 0.59. This insignificant wealth effect also endorses the existing data trend of Pakistan where the per-capita wealth ratio is very low.

Table3: Dynamic-OLS Regression Results

Dependent Variable: log of real Per-capita Aggregate Consumption		
Variables	Model 1 Coefficient (T-Ratio) [Prob]	Model 2 Coefficient (T-Ratio) [Prob]
Log Real Per-capita Income	0.676 (2.536) [0.017]	0.721 (2.558) [0.016]
Log Real Per-capita Wealth	0.006 (0.030) [0.976]	-0.024 (-0.117) [0.908]
Overall Dependency Ratio	-0.043 (-3.144) [0.004]	
Working age Dependency Ratio		-0.013 (-2.674) [0.013]
Constant	4.995 (3.201) [0.004]	3.935 (2.767) [0.010]

[1] The MPCs are generated through dividing the elasticity coefficients with ratio of average wealth to average consumption and average GDP to average consumption.

In order to avoid the regression ills we estimated all the models with Newey-West (1987) HAC method which produces the consistent coefficient and removes the biased of autocorrelation and heteroscedasticity.

The robustness of the results and in search of the reasons of these deviations, which is mostly in terms of sign of the wealth variable, we also applied Ridge regression for incorporating the multicollinearity among the explanatory variables especially between M2 and GDP. However, the results of ridge-regression produced the same results[1].

6. Conclusion and Recommendation

This study empirically investigated the role of wealth in aggregate consumption, which is one important variant of the lifecycle hypothesis. The lack of availability of official data for household wealth and household income in Pakistan has made it challenging to choose the appropriate proxy for both. Following the literature in this study we employed two different proxies for wealth i.e. per-capita broad money (M2) and per-capita market capitalization, to find the marginal propensity to consume out of wealth for Pakistan. The estimated results do not support the long-run (cointegration) relationship among aggregate consumption, income and market capitalization; hence we had to leave this proxy and adopted per-capita broad money (M2) which has cointegrating relationship with consumption and income.

The study results show that the wealth coefficient is insignificant in both of the cases. Further the age-structure variables i.e. overall dependency and working age dependency ratio both have negative effect on consumption. The overall results refuted the lifecycle conjecture in case of Pakistan, as the wealth has in-significant effect on consumption and dependency ratios have contradictory sign against the lifecycle assertions. The non-existence of lifecycle hypothesis may be, plausibly, due to some distinctive feature of Pakistani society. Such as, the significant negative sign of dependency ratio support our social behavior where old-age people sacrifice their consumption for younger and another motive is bequest which certainly dominates in Pakistani society. These finding are similar with other low-income countries as Athukorala and Sen (2004) and Samantaraya and Patra (2014) in case of India found the same insignificant wealth effect.

[1] For the sake of brevity results are not mentioned.

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Appendix A: Cointegration Results:

Table A1: F-statistics for Cointegration relationship

Models	F-statistics	Bounds Critical Values* (Restricted Intercept with no trend)			Bounds Critical Values* (Restricted Intercept with trend)	
		Significance Level	I(0)	I(1)	I(0)	I(1)
Consumption, M2 and Income	5.358976**	1%	4.77	5.855	5.893	7.337
Consumption, Market Capitalization and Income	1.775101	5%	3.435	4.26	4.133	5.26
		10%	2.835	3.585	3.373	4.377
Consumption, M2 , Income, and Over all Dependency	5.011821**	1%	4.31	5.544	5.018	6.61
Consumption, Market Capitalization, Income, and Over all Dependency	3.273612	5%	3.1	4.088	3.547	4.803

		10%	2.592	3.454	2.933	4.02
Consumption, M2, Income, and working Age Dependency	4.881698**	1%	4.31	5.544	5.018	6.61
Consumption, Market Capitalization, Income, and working Age Dependency	3.286417	5%	3.1	4.088	3.547	4.803
		10%	2.592	3.454	2.933	4.02
Consumption, M2, Income, and Unemployment	4.106683**	1%	4.31	5.544	5.018	6.61

Table A1(continued): F-statistics for Cointegration relationship

Models	F-statistics	Bounds Critical Values* (Restricted Intercept with no trend)			Bounds Critical Values* (Restricted Intercept with trend)	
		Significance Level	I(0)	I(1)	I(0)	I(1)
Consumption, Market Capitalization, Income, and Unemployment	1.374544	5%	3.1	4.088	3.547	4.803
		10%	2.592	3.454	2.933	4.02

Consumption, M2, Income, Unemployment and overall dependency ratio	3.87207	1%	3.967	5.455	4.428	6.25
Consumption, Market Capitalization, Income, Unemployment and overall dependency ratio	2.600956	5%	2.893	4	3.202	4.544
		10%	2.427	3.395	2.66	3.838
Consumption, M2, Income, Unemployment and Working age dependency	3.774812	1%	3.967	5.455	4.428	6.25
Consumption, Market Capitalization, Income, Unemployment and working age dependency ratio	2.619287	5%	2.893	4	3.202	4.544
		10%	2.427	3.395	2.66	3.838

* Based on Naryan (2004)

** Indicates the existence of Cointegration at 5% level of significance