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Climate Change, Cereal Production and Economic Growth: An Application of Generalized Method of Movement (GMM)

*Sana Iftikhar & **Muhammad Abdul Quddus

Abstract: Developing countries like Pakistan, India and Bangladesh shares various common challenges in addressing existing and future climate hazards. This study examines the impact of climate change and cereal production on economic growth in Pakistan, India and Bangladesh for the period 1971–2013. The variables employed in the study are carbon dioxide emissions, methane emissions, nitrous oxide emissions, total greenhouse gases emissions, cereal production and GDP growth rate. Generalized method of moments (GMM) analysis is used to evaluate different equations in relation to climatic factors and cereal production with economic growth in Pakistan, India and Bangladesh. The results show that effects of climate change variables have negative relationship with economic growth both in case of Pakistan and India. While the situation is different in case of Bangladesh. Carbon dioxide emissions and methane emissions are positively while nitrous oxide emissions and total greenhouse gases emissions are negatively related with economic growth. There is need to overcome the problem of climate change by expanding climatic and agricultural research to improve the economic situation of a country.

Keywords: climate change, cereal production, economic growth, generalized method of moment,
JEL Classification: Q54, F43, E23

1. Introduction

Climate change is one of the very challenging and difficult problems now a days faced by the global world. The phenomena climate change affects agriculture in a number of ways, especially crop productivity which receive the direct impact from climate change (Ziervogel, Bharwani & Downing, 2006). According to 4th Assessment Report of Integrated Panel of Climate Change (IPCC), climate change mainly increased threat of floods and droughts which probably have severe influence on the economies of South Asian countries. South Asian economies mainly rely on agriculture, natural

*The author is a PhD Scholar at Department of Economics, National College of Business Administration & Economics, Lahore
**The author is the Head of Department, Department of Economics, National College of Business Administration & Economics

resources, forestry and fisheries. Though South Asia has very low greenhouse gas (GHG) emissions and climate change has severely affected the economic development & growth. Almost 70% of South Asians live in rural area and account for about 75% of the poor, who are the most impacted by climate change (IFAD and UNEP, 2015).

The rise in temperature could be coupled with changes in rainfall pattern, rise in sea level, frequency and severity of extreme events namely, cyclones and droughts etc. The sum of all these changes is referred to as climate change. During last century average annual temperature in Pakistan increased by 0.6^0 C and at global level it is increased by 0.9^0 C. It is estimated that average temperature in Pakistan will increase upto 1.3 ^{0}C - 1.5 ^{0}C and at global level it will increase upto 2.8 ^{0}C -3.4 ^{0}C by 2020 (Five Year Plan of Pakistan, 2013-2018). Modern world is facing one of the prominent problems in the form of climate change. GHG emission, generate many gases like carbon dioxide (CO_2), methane (CH) and nitrous oxide (N_4O) which are responsible for causing climate change. Concentration of CO_2, out of overall GHG is greater as compared to other gases. For example, in Pakistan from overall GHG, CO_2 is 54%, methane is 36% and nitrous oxide is 10%. While the concentration of CO_2 is 0.48% in Pakistan, 6.8% in India, 15% in USA and 30% in China. Climate change has highlighted severe concerns for developing countries like Pakistan, India and Bangladesh which are facing remarkable social, economic and environmental impacts.

Agricultural production is primarily determined by climate change and slightly adverse variations will have damaging affects in agriculture sector. Change in climatic situations initiating crop failures and also affects the livings of the population which involves in the agricultural practices and applications for their support (Calzadilla, 2008). Agriculture is the central element of an economy like Pakistan because it is a major source of raw material and food security. Agriculture, food security and economic growth mutually interact and reinforce each other in the process of growth (Government of Pakistan, 2016).

Cereal crops which includes wheat, maize & paddy, and these cereal crops are the primary & staple crops which full fill the hunger of many people

globally (Godfray, et. al. 2010). There is need to boost up the production of cereal crops to meet the increasing demand and fill the increasing gap between supply and demand of food. Boosting the production rates is generally accepted as the solution to meet the increasing demand, it is observed that the current rate of production is closer to the past one and to maintain this level of production we have to overcome the phenomena of climate change. (Ray, el at. 2013). Climate change could leads to decrease in fertile and arable land via flood and drought which also need concentration of policy makers (Hawkesford, et. al.2013).

The main purpose of this study is to empirically explore the relationship between CO_2 emissions, methane emissions, nitrous oxide emission, cereal production and economic growth of Pakistan, India and Bangladesh. Different from earlier studies in the literature, we used generalized method of moments (GMM) technique. To the best of our knowledge, there has been no study that tried to estimate these variables for Pakistan, India and Bangladesh through generalized method of moment .The rest of the paper is organized as follows. Section 2 describes the literature review, section 3 contain methodology, while section 4 provides the results, section 5 concludes and section 6 continue with references.

1.1. Problem Statement

Empirical studies revealed that climate change affects agriculture sector that is at risk to climate change economically and physically both (Gbetibouo & Hassan, 2004). Climate changes can reduce the cereal production considerably. We can say that cereal production is mainly determined by climate and its variations. Changing situation of climate, reduce the chances of crop's cultivation, which disturbs the livings of the population especially those who opt agriculture as a source of income in the form of agricultural practices and applications (Calzadilla, 2008). Climate change then further affect food production (Funk & Brown, 2009), agriculture and food systems are the important elements of nutrition and public health (Kanter, et al. 2015) and health is an important element of economic growth (Barro, 2013).

1.2. Novelty of the Study

International Organizations publish reports to highlight the status of the countries all around the world considering the significance of climate change and its impacts globally. There is a significant body of research on climate change, cereal production and economic growth. But the objectives of this study are unique and have not been addressed before in the case of South Asia (Pakistan, India and Bangladesh). Therefore a great research gap is observed to see the impact of climate change on economic growth through agricultural production.

1.3. Research Question

- How does climate change affect the economic growth through cereal production?

1.4. Hypothesis

Following are the null and alternative research hypothesis:

1. H_0 = Climate change has no impact on cereal production.
   H_1 = Climate change has impact on cereal production.
2. H_0 = Climate change has no impact on economic growth.
   H_1 = Climate change has impact on economic growth.
3. H_0 = Cereal Production has no impact on economic growth.
   H_1 = Cereal Production has impact on economic growth.

1.5. Objective of the Study

- To empirically investigate the effect of Climate Change and Cereal Production on Economic Growth in Pakistan, India and Bangladesh.
- To provide policy implications.

2. Literature Review

Following are some research works which have done to see the issue of climate change and its affected dimensions.

Afzal, et al. (2016) empirically investigated the impact of climate change on three major crops, produced in Punjab, Pakistan, they used Cobb-Douglas production function by using panel data. They used district level data from 1981-2012. They also find that temperature has negative relationship with the wheat production in flowering stage. Rainfall is negatively related with wheat production in every stages. They concluded that minimum temperature, rainfall pattern and humidity have positive relationship with rice production.

Qureshi, et al. (2016) they examined relationship between agricultural production, energy demand, fuel energy, air pollution and GHG emissions in Pakistan by using data from 1980 to 2013. Agricultural production variable further divided into wheat, sugarcane, rice, cotton production and agriculture value added. They used Generalized Method of Moments (GMM) estimator to estimate the environmental factors and agricultural production in a country through different simultaneous equations. They find out that CO_2 emissions is positively and energy sources is negatively related wit agricultural value added. Sugarcane production and cotton is directly related with fossil source of energy, while sugarcane production and wheat are directly related with CO_2 emission. Greenhouse gas emission severely affect agricultural production which includes cotton, rice and wheat production.

Tebaldi & Beaudin (2015) explored the impact of climate change on economic growth in Brazil. They used precipitation data monthly from 1970 to 2011 from different 265 weather stations and Real GDP data annually from 1985 to 2011. They applied dynamic panel model for analysis. They concluded that Real GDP growth rate decreased by 0.92% in the direct result of spring droughts in Northeast region while there will be no significance effect on other region. In case of summer flood, real GDP growth rate decreased by 0.39% in Northeast region and Southeast region has no effect.

Wei, et al. (2014) estimated the climate change impact on crop yield. They used provisional panel data of China to estimate constant & inconstant elasticities. Elasticities was used according to temperature and precipitation. They concluded that change in temperature has positive relationship with wheat and rice. They also concluded that impact of

climate change on crop yield would not be an issue in China if positive impacts of other socio-economic factors continue in the future.

Yang & Zhu (2013) they analyzed the two-sector model, both for traditional agriculture and modern agriculture. Comparative price of industrial product will reduce by industrial development in case of traditional technology development. This reduction in prices has very low effect on income per capita. When traditional agricultural techniques turn into modern agricultural techniques than income per capita will be increased and economy will lead towards sustainable growth.

Shakoor, et al. (2011) examined the impact of climate change on agriculture in arid region of Pakistan. They used a cross-sectional data from Rawalpindi Metrological Stations. They used Ricardian Approach to investigate the relationship among climate change and Net Farm Revenue (NFR) and climate of the arid region. Results show that increase in temperature has negative impact on agriculture production. Additionally, with the increase in rainfall, revenue will also increase. It is estimated that 1% increase in temperature will lead to decrease the net revenue by Rs. 4180. It is recommended that for rapid and efficient agricultural production in arid region of Pakistan, there is need to adopt the new methods of irrigation, crop farming and crop pattern.

Janjua, et al. (2010) analyzed the impact of climate change on wheat production in case of Pakistan. They used Vector Autoregression (VAR) to see the impact of climate change in Pakistan particularly wheat production. The data was based on last half century. Results show that there is that negative effect of climate change on wheat production is not exist presently. Though in future the effect of climate change in the form of water availability and temperature will affect the wheat production in Pakistan.

Dell, et al. (2008) analyzed the effect of climate change on economic growth. They used annual data of temperature and precipitation of 50 years all over the world. They used Panel data analysis for this purpose. The results reveal that with the increase in temperature economic growth tends to reduce in case of poor countries, in other poor countries growth rate tends to reduce with the increase in temperature while in the third type of poor

countries agricultural and industrial output will increase along with investment and political instability.

3. Methodology

Methodology has a very important role in accomplishing the desired objectives of the study through using various tools & techniques. As the situation of climate change is worsen day by day all around the world especially in South Asian countries, so the selected research areas in this study are Pakistan, India and Bangladesh.

3.1. Data and Variables

Required secondary data is collected from World Development Indicators (WDI) from 1971 to 2013. A various number of variables will be utilized to fulfill the desired objectives of the study which are cereal production and GDP growth rate and various climate change variables along with instrumental variables. E-views 10 was used for generalized method of moment analysis. List of cereal crops are given below[1];

- Rice (mainly Oryza sativa)
- Job's Tears, salay, adlay, tigbe, pawas (Coix lachryma-jobi)
- Oat (Avena sativa)
- Fonio (Digitaria exilis)
- Wheat, bread wheat (Triticum aestivum)
- Barley (Hordeum vulgare)
- Rye (Secale cereale)
- Wild rice, Canada rice, Indian rice, water oats (Zizania spp.)
- Durum wheat, macaroni wheat (Triticum durum)
- Millet (Panicum miliaceum, Eleusine coracana, Setaria italica, Pennisetum glaucum)
- Triticale (Triticosecale)
- Spelt (Triticum spelta)
- Corn or maize (Zea mays)
- Sorghum (Sorghum bicolor)
- Teff, taf (Eragrostis tef)

[1] https://www.cropsreview.com/cereal-crops.html

- Canary grass (Phalaris sp.)

3.2. Description of Variables:

Here is the description of the variables used in the study.

3.2.1. Cereal Production

Data related to cereal crops harvested are taken from the dry grains only and crops used only for grazing are not included in this data (WDI-2018).

3.2.2. GDP Growth Annual

GDP growth rate is the annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars (WDI-2018).

3.2.3. Carbon Dioxide Emissions

Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring (WDI-2018).

3.2.4. Methane Emissions

The emissions are taken from the whole energy process, either its production, handling, transmission or combustion of fossil fuels and biofuels (WDI-2018).

3.2.5. Nitrous Oxide Emissions

Nitrous oxide emissions are emissions from agricultural biomass burning, industrial activities, and livestock management (WDI-2018).

3.2.6. Total Greenhouse Gases

Total greenhouse gas emissions in kt of CO_2 equivalent are composed of CO_2 totals excluding short-cycle biomass burning but including other biomass burning, all anthropogenic CH_4 sources, N_2O sources and F-gases (WDI-2018).

3.3. Econometric Modeling

The relationship between climate change variables, cereal production and economic growth can be expressed in a linear relationship as shown:

$$EG = f(CC, CP)$$

EG is economic growth, CC is climate change and CP is cereal production. To determine the relationships between endogenous and exogenous variables under study Generalized Method of Movement (GMM) method is employed by using Eviews-10. Nevertheless, following econometric models are selected to explain the results of the study for Pakistan, India and Bangladesh.

Model-I: Impact of Carbon Dioxide Emissions and Cereal Production on Economic Growth.

$$ln(GDP)_t = \alpha_0 + \beta_1 ln(GDP)_{t-1} + \beta_2 ln(CO_2)_t + \beta_3 ln(CP)_t + \lambda_t + \varepsilon_t$$

Model-II: Impact of Methane Emissions and Cereal Production on Economic Growth.

$$ln(GDP)_t = \alpha_0 + \beta_1 ln(GDP)_{t-1} + \beta_2 ln(CH)_t + \beta_3 ln(CP)_t + \lambda_t + \varepsilon_t$$

Model-III: Impact of Nitrous Oxide Emissions and Cereal Production on Economic Growth.

$$ln(GDP)_t = \alpha_0 + \beta_1 ln(GDP)_{t-1} + \beta_2 ln(N_4O)_t + \beta_3 ln(CP)_t + \lambda_t + \varepsilon_t$$

Model-IV: Impact of Total Greenhouse Gases and Cereal Production on Economic Growth.

$$ln(GDP)_t = \alpha_0 + \beta_1 ln(GDP)_{t-1} + \beta_2 ln(GHG)_t + \beta_3 ln(CP)_t + \lambda_t + \varepsilon_t$$

GDP= GDP Growth Rate, CO_2= Carbon Dioxide Emissions, CH= Methane Emissions, N_4O= Nitrous Oxide Emissions, GHG= Total Greenhouse Gases, CP = Cereal Production, 't' represent time period, ln represents natural logarithm, λ shows lagged of the explanatory variables, and ε_t represents error term.

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistics

Table 4.1: Descriptive Statistics of variables in case of Pakistan

	Cereal Production	GDP Growth Annual (%)	CO2 Emissions (kt)	Methane Emissions (kt) of CO_2 Equivalent	Nitrous Oxide Emissions Thousand Metric Tons of CO_2 Equivalent	Total Greenhouse Gases Emissions (kt) of CO_2 Equivalent
PAKISTAN						
Mean	23541427	4.710102	81103.21	97495.25	21417.56	195766.2
Median	22123350	4.832817	72789.95	92710.90	20912.17	175960.6
Maximum	38157384	10.21570	163060.5	158336.6	30651.23	369734.6
Minimum	11336393	0.468373	18929.05	1590.000	0.000000	0.000000
Std. Dev.	7919981.	2.267079	49295.11	35088.04	6094.909	91788.51
Probability	0.257837	0.721961	0.163999	0.963310	0.006176	0.404471
Sum	1.01E+09	202.5344	3487438.	4192296.	920955.3	8417947.
Sum Sq. Dev.	2.63E+15	215.8652	1.02E+11	5.17E+10	1.56E+09	3.54E+11
Observations	43	43	43	43	43	43

INDIA						
Mean	1.98E+08	5.519930	835920.8	516963.3	167674.3	1550341
Median	2.04E+08	5.829938	711392.5	526819.0	178341.1	1464843
Maximum	2.94E+08	10.25996	2034752.	636395.8	239755.1	3002895
Minimum	1.07E+08	-5.238183	205869.0	401434.0	86999.95	754018.5
Std. Dev.	55714892	3.022796	558487.2	70450.92	48694.37	633484.8
Probability	0.338844	0.000192	0.089338	0.292234	0.157192	0.222600
Sum	8.70E+09	242.8769	36780514	21712460	7042323.	65114332
Sum Sq. Dev.	1.33E+17	392.9036	1.34E+13	2.03E+11	9.72E+10	1.65E+13
Observations	43	43	43	43	43	43
BANGLADESH						
Mean	31389897	4.051639	24567.90	90831.69	17684.51	135477.8
Median	28031812	4.802472	17577.76	88402.00	19172.57	128764.0
Maximum	55069990	9.591956	68950.60	105141.6	26682.82	183300.6
Minimum	15088878	-13.97373	3509.319	83607.60	9460.425	107540.6
Std. Dev.	11916122	3.794028	20015.23	6027.641	5481.405	22547.33
Probability	0.134845	0.000000	0.039091	0.002468	0.210093	0.057523
Sum	1.38E+09	178.2721	1080988.	3996594.	778118.5	596102 4.

Sum Sq. Dev.	6.11E+15	618.9700	1.72E+10	1.56E+09	1.29E+09	2.19E+10
Observations	43	43	43	43	43	43

Table-4.1 shows the descriptive statistics of the variables for ready reference. The minimum value of CO_2 is 18929.05 (kt), and the maximum value is 163060.5. The mean value of CO_2 is 8 1103.21 with the standard deviation of 49295.11. In case of Methane emissions (kt) of CO_2 equivalent, mean value is 97495.25, median is 92710.90, minimum value of methane emission is 1590.000 while the maximum value is 158336.6 and Standard deviation of methane is 35088.04. It is shown in the table that mean value nitrous oxide emissions thousand metric tons of CO_2 equivalent is 21417.56, median is 20912.17, maximum value is 30651.23, minimum value is 0.000 and standard deviation is 6094.909. Mean value of total greenhouse gases emissions (kt) of CO_2 equivalent is 195766.2 while median, maximum, minimum and standard deviation are 175960.6, 369734.6, 0.000 and 91788.51 respectively. Descriptive statistics of the variables for India, the minimum value of CO_2 is 18929.05 (kt), and the maximum value is 205869.0. The mean value of CO_2 is 835920.8 with the standard deviation of 558487.2. In case of Methane emissions (kt) of CO_2 equivalent, mean value is 516963.3, median is 526819.0, minimum value of methane emission is 401434.0 while the maximum value is 636395.8 and Standard deviation of methane is 70450.92. It is shown in the table that mean value nitrous oxide emissions thousand metric tons of CO_2 equivalent is 167674.3, median is 178341.1, maximum value is 239755.1, minimum value is 68999.95 and standard deviation is 48694.37. Mean value of total greenhouse gases emissions (kt) of CO_2 equivalent is 1550341 while median, maximum, minimum and standard deviation are 1464843, 3002895, 754018.5 and 633484.8 respectively.

Descriptive statistics of the variables for Bangladesh, the minimum value of CO_2 is 3509.3 (kt), and the maximum value is 68950.6. The mean value of CO_2 is 24567.90 with the standard deviation of 20015.23. In case of Methane emissions (kt) of CO_2 equivalent, mean value is 90813.69, median is 88402.0, minimum value of methane emission is 83607.60 while the

maximum value is 105141.6 and Standard deviation of methane is 6027.64. It is shown in the table that mean value nitrous oxide emissions thousand metric tons of CO2 equivalent is 17684.51, median is 19172.57, maximum value is 26682.82, minimum value is 9460.4 and standard deviation is 5481.40. Mean value of total greenhouse gases emissions (kt) of CO2 equivalent is 135477.8 while median, maximum, minimum and standard deviation are 128764.0, 183300.6, 107540.6 and 22547.33 respectively.

4.1.1. Generalized Method of Moments (GMM) Analysis:

Generalized Method of Movements is a technique used to analyze the relationship between cereal production, climatic factors and economic growth in order to address the country's fixed effects and to solve the endogeneity problem of the studied models. The robust factor's evaluations will be obtained by taking first lagged of the dependent variable and by using number of instrumental variables. The GMM estimator is typically used to correct for bias caused by endogenous explanatory variables.

In the context of Pakistan, India and Bangladesh, the study will use GMM estimator for estimating the simultaneous equations modeling by monitoring possible heteroscedasticity and endogeneity problems from the evaluated model. Traditional OLS model holds the endogeneity problem, that's why we have applied the GMM model, proposed by Arellano and Bond (1991), with lagged dependent variables. The GMM, which is a form of instrumental variable estimation, relaxes the assumptions of both serial correlation and heteroscedasticity, also solve the problem of endogeneity among variables.

Table 4.1.1: Impact of Climate Change Variables and Cereal Production on Economic Growth in case of Pakistan

	Model-1		**Model-2**		**Model-3**		**Model-4**	
Dependent Variable = lnGDP								
Independent Variables	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**
Constant	-19.92440	0.2124	-9.283409	0.3382	6.038094	0.2648	-42.75990	0.0089

$GDP_{(-1)}$	0.094 352	0.29 61	0.026 725	0.80 84	0.043 149	0.65 64	0.171 418	0.08 34
$lnCO_2$	- 1.108 045	0.09 33						
lnCP	1.988 254	0.14 61	3.186 942	0.07 68	0.019 751	0.98 72	6.069 542	0.00 33
lnCH			- 3.765 755	0.04 54				
lnN_4O					- 0.494 663	0.77 86		
lnGHG							- 4.823 761	0.00 20
R-square	0.268		0.216		0.185		0.305	
Prob (J-statistic)	0.005 1		0.025 4		0.000 98		0.043 8	

Table 4.1.1 shows the GMM estimation on carbon dioxide emissions, cereal production and economic growth. The results show that carbon dioxide emissions have negative relationship with economic growth, with the decrease in carbon dioxide emissions, economic growth tends to reduce. Cereal production has positive relationship with economic growth, with the increase in cereal production economic growth will increase. Because when there is more cereals or food are available, hunger will reduce and people gain the desirable health by completing their daily calorie intake requirement. As health is an important element of human capital development, so with increase in health status of a country, human capital development environmental leads in a country. With the efficient scale of human capital development, a country will definitely improve. The coefficient values indicate that when there will be 1% increase in carbon dioxide emissions and cereal production and, economic growth will tend to decrease by 1.10% and increase by 1.98% respectively.

Table 4.1.2: Impact of Climate Change Variables and Cereal Production on Economic Growth in case of India

	Model-5		Model-6		Model-7		Model-8	
Dependent Variable = lnGDP								
Independent Variables	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**
Constant	-28.41734	0.0751	-0.918360	0.9439	-32.83377	0.0015	-30.39201	0.0028
$GDP_{(-1)}$	0.075452	0.1145	0.065136	0.0310	0.065807	0.0257	0.069051	0.0184
$lnCO_2$	-0.358898	0.4552						
lnCP	1.828292	0.1171	2.986144	0.0395	2.903450	0.0132	2.497791	0.0173
lnCH			-4.132405	0.1667				
lnN_4O					-1.738671	0.0968		
lnGHG							-1.027484	0.1456
R-square	0.613		0.580		0.601		0.597	
Prob (J-statistic)	0.0692		0.0908		0.0562		0.0597	

Table 4.1.2 shows the GMM estimation on carbon dioxide emissions, cereal production and economic growth in case of India. The results show that carbon dioxide emission, methane emission, nitrous oxide emission and total greenhouse gases have negative relationship with economic growth in case of India, with the decrease in carbon dioxide emissions, economic growth tends to reduce. Cereal production has positive relationship with economic growth, with the increase in cereal production economic growth will increase. The coefficient values indicate that when there will be 1% increase in carbon dioxide emissions and cereal production, economic

growth will tend to decrease by 0.35% and increase by 1.82% respectively. With the 1% increase in methane emission, nitrous oxide emission and total greenhouse gases, the economic growth will tend to reduce by 4.13%, 1.73% and 1.02% respectively. In the presence of these climatic variables, cereal production will affect the economic growth by 2.98%, 2.90% and 2.49% respectively in a positive manner.

Table 4.1.3: Impact of Climate Change Variables and Cereal Production on Economic Growth in case of Bangladesh

	Model-9		**Model-10**		**Model-11**		**Model-12**	
Dependent Variable = Log of GDP Growth Annual (%)								
Independent Variables	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**	**Co-efficient**	**p-value**
Constant	15.53512	0.2704	3.401918	0.8538	-6.903056	0.0744	-17.00435	0.0309
$GDP_{(-1)}$	0.091326	0.0014	0.086958	0.0101	0.0.89411	0.0013	0.051681	0.0286
$lnCO_2$	0.885903	0.0646						
lnCP	-1.323925	0.2224	0.964837	0.0285	-0.158473	0.7588	-0.137167	0.8589
lnCH			-1.627313	0.4554				
lnN_4O					1.134887	0.0809		
lnGHG							1.764348	0.3010
R-square	0.317		0.296		0.333		0.398	
Prob (J-statistic)	0.0693		0.0201		0.0994		0.0234	

Table 4.1.3 shows the GMM estimation on carbon dioxide emissions, cereal production and economic growth in case of Bangladesh. The results show

that carbon dioxide emission, nitrous oxide emission and total greenhouse gases have positive relationship with economic growth in case of Bangladesh, while only methane emission has negative relationship with economic growth. The scenario is different from Pakistan and India. The situation of relationship among cereal production and economic growth in the presence of climate change variable is also opposite in Bangladesh as compared to Pakistan and India. With the increase in carbon dioxide emissions, nitrous oxide emission and total greenhouse gases, economic growth tends to increase by 0.88%, 1.13% and 1.76% respectively. While with the 1% increase in methane emission, economic growth will reduce by 1.62%. Cereal production has positive relationship with economic growth, with the increase in cereal production economic growth will increase. The coefficient values indicate that when there will be 1% increase in carbon dioxide emissions and cereal production and, economic growth will tend to decrease by 0.88% and increase by 1.82% respectively. With the 1% increase in methane emission, nitrous oxide emission and total greenhouse gases, the economic growth will tend to reduce by 4.13%, 1.73% and 1.02% respectively. In the presence of these climatic variables, cereal production will affect the economic growth by 2.98%, 2.90% and 2.49% respectively in a positive manner.

5. Conclusion and Policy Recommendations

The study focuses on the impact of climate change on production of two major crops of South Asian countries mainly Pakistan, India and Bangladesh. Time-series analysis is done for each country; data was collected from different secondary sources from 1971 to 2013. Generalized Method of Movement is used for analysis. Agricultural production depends on climatic situation of a country which plays a vital role in the economies, particularly agricultural economies like Pakistan, India and Bangladesh. Results show that effects of climate change variables which are carbon dioxide emission; methane emission, nitrous oxide emission and total greenhouse gases emission have negative relationship with economic growth both in case of Pakistan and India, while the situation is different in case of Bangladesh. According to results, out of four climatic variables two variables effect the economic growth positively (carbon dioxide emission and methane emission) and the other two effect the economic growth of Bangladesh negatively (nitrous oxide emission and total greenhouse gases

emission). The reason might be that carbon dioxide emission is the result of industrialization which positively contributing in the economy by increasing GDP, but due to increase in CO_2, atmospheric temperature will also increase which is harmful for crop production (agriculture sector). Concentration of carbon dioxide emissions Effect of cereal production on economic growth is same in Pakistan and India while Bangladesh shows contradictory results as compared to Pakistan and India.

There is need to overcome the problem of climate change both in Pakistan and India particularly in the situation of total greenhouse gases which includes carbon dioxide emission, methane emission; nitrous oxide emission and total greenhouse gases. When the atmospheric concentration of these gases increases, it leads to increase in the atmospheric temperature which further effects the agricultural production and ultimately leads to decrease in the economic growth of an economy. There is a dire need to expand climatic and agricultural research for the improvement of the farmers. Agricultural sustainability is one of the required ways to alleviate the climatic fear & air pollution that would more support the agricultural set-up for healthy life. There should be an improvement in education, awareness raising and institutional capacity building on early warning signs, climate change reduction, and adaptations.

Finally, the Government of Pakistan and India should assimilate climate change actions into the national policies, strategies and planning to support the economy's effort for attaining a sustainable environment. Implementing air pollutant emission control modules, other cleaner and more proficient technologies will certainly decrease air pollution. These technologies will mitigate final energy use and developing countries like Pakistan, India and Bangladesh will be able to reduce total greenhouse gas emission particularly the CO_2 emissions because it has more concentration as compared to other greenhouse gases. We can summarize the results by stating that South Asian agriculture is sensitive to climate variations. Policy implications and adaptations have been recommended to mitigate the impacts of climate change on agricultural productivity and economic growth.

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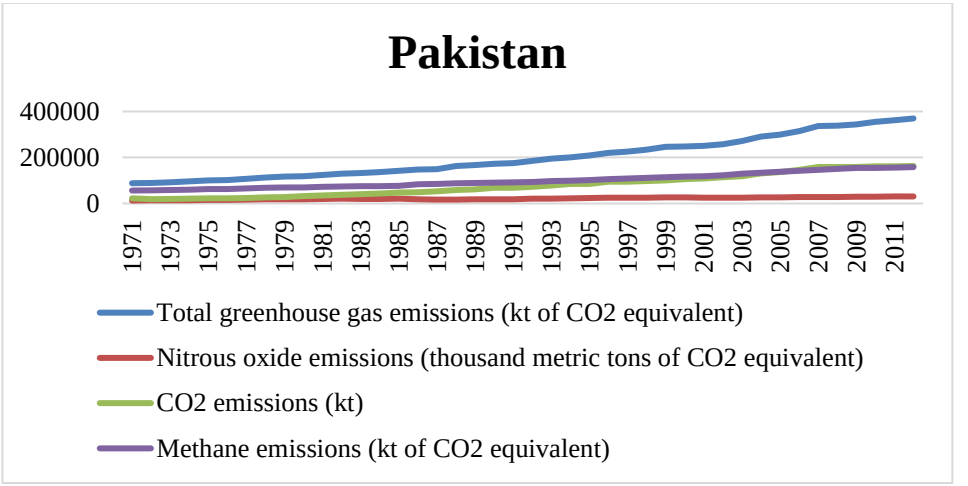
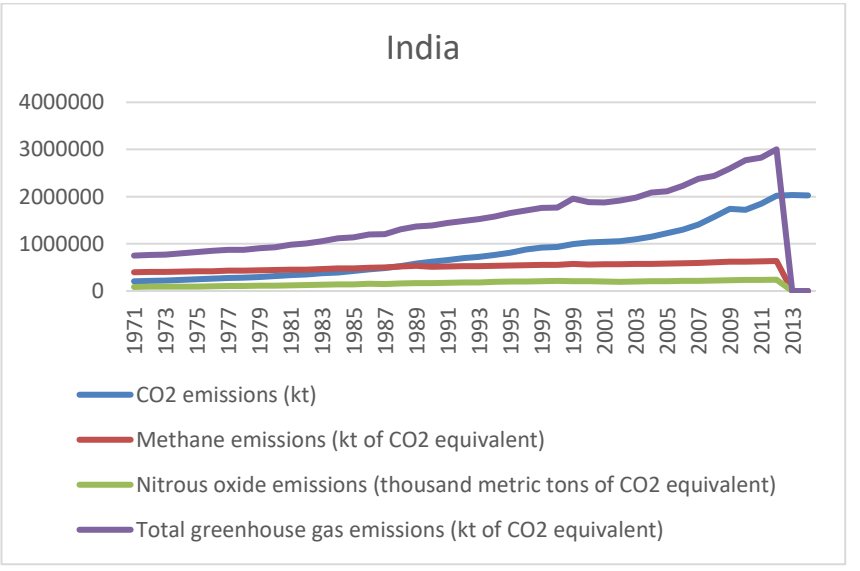
Appendix

Appendix-1: Situation of Climate Change in case of Pakistan.



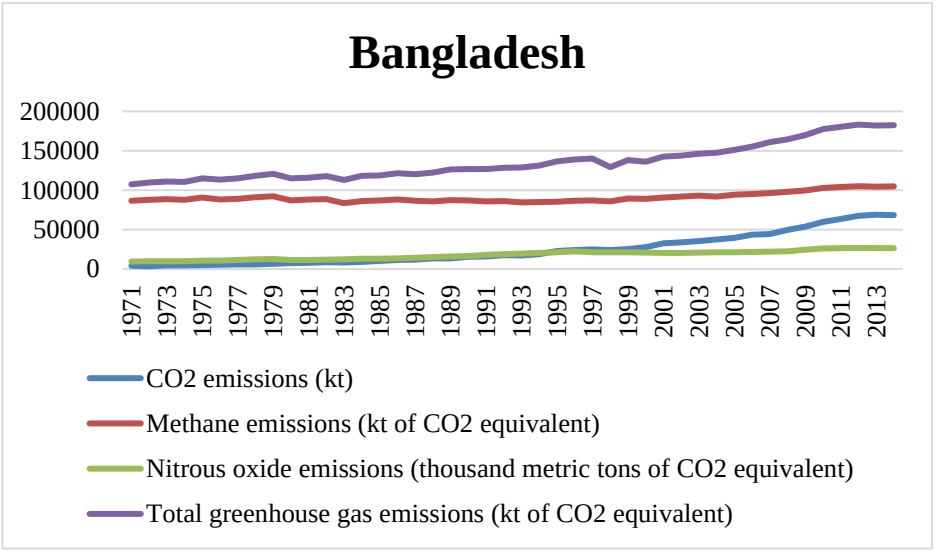
Source: WDI, (2015).

Appendix-2: Situation of Climate Change in case of India.



Source: WDI (2015)

Appendix-3: Situation of Climate Change in case of Bangladesh.



Source: WDI, (2015)

*The author is an Associate Professor in the University of Lahore
**The author is a PHD Scholar at the National College of Business Administration and Economics

Fertility, Mortality and Inequality

*Javaria Sarwar & **A. R. Chaudhary

Abstract: Present paper discovers the behaviour of fertility differentials across districts of Punjab, Pakistan. Social researchers agree that development and quality of life of the people are associated with distribution of economic resources. The objective is to investigate some salient determinants of fertility differential through distribution of income. Data used in this study is gathered from Multiple Indicator Cluster Survey 2013-14. Both parametric and non-parametric analysis is done. Regression analysis is used to investigate the relationship of fertility determinants. For empirical analysis, Total Fertility Rate is taken as an outcome variable while distribution of income, unemployment rate, under-five mortality and contraceptive use are considered as determinants. The outcome of this study is that distribution of income is a very significant variable in determining the level of fertility so inequality might be reduced to overcome the issue of high fertility rates at the district level of Punjab. Contraceptive use is also a very effective variable in determining the level of fertility. It is found that child mortality has a positive relationship with fertility rates. Unemployment rate is a very useful variable for the determination of fertility level.

Key words: Fertility, Mortality, Inequality, Regression Analysis, Non-Parametric model
JEL Classification: I12, J13, C14.

1. Introduction

Population studies have a long history in economic literature. Population growth has been observed as a very significant determining factor of economic growth. However, fertility has a very essential title role in defining population growth rate. Fertility differentials matter as it also has an impact on human capital accumulation. Population size and composition basically relied upon factors of mortality, fertility and migration. However, fertility is very fundamental determinant, as it is crucial for continuance of life. Fertility examination is a significant consideration for policy making

to take guideline for family planning. Differential fertility is an essential aspect of demographic studies. Numerous studies have conducted for exploring causes of various differentials in fertility.

1.1. Situation of Total Fertility in Pakistan

Since the inception of family planning program in Pakistan in 1950s, many governments attempted to check population growth, through increased allocation of resources to family planning activities, the involvement of non-government sector and by adopting multi-dimensional approaches. Democratic governments extended the program to outreach areas by involving field workers for doorstep access to family planning services. Extensive mass media campaigns were launched to create awareness and motivation for contraceptive use. Efforts were also made to integrate health and family planning services. Despite all these efforts and huge investment, population continues to grow at a fast pace. Huge public spending as well as public and private partnership were hardly able to bring down Total Fertility Rate to 4.8 births per women in 2010 [National Institute of Population Studies (NIPS, 2010)].

The population increased from 32.5 million in 1947 to 143.17 million in 2002, 148.72 million in 2004 and 152.53 million in 2005 making Pakistan the 7th populous country in the world (GOP, various issues). In absolute terms, 120 million people have been added to the population during 58 years. Pakistan experienced 6-7 births per women in the early 1990s (Sathar and Zaidi, 2009 & Hakim, 1994). This predicts future demographic momentum for population increase. Every passing minute adds eight new babies to the population and 70 children breathe their last every hour in Pakistan. [UNICEF (2010)]

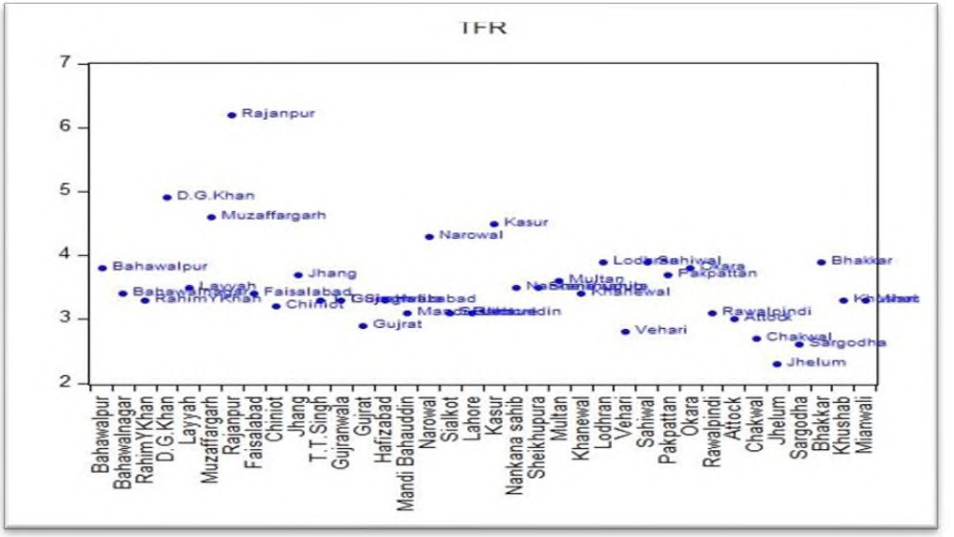
High fertility rate is the main determinant behind the differences among the population growth rates in Pakistan as well as some South Asian countries. Bangladesh total fertility rate is 2.3 percent, Bhutan total fertility rate is 2.6 percent, China's TFR 1.5 percent, India's TFR is 2.4 percent, Nepal's total fertility rate is 2.6 percent, Sri Lanka's total fertility rate is 2.1 percent and

Maldives's total fertility rate is 2.3 percent. According to the latest issue of Pakistan Economic Survey, 2014, total fertility rate of Pakistan is 3.2 percent. Total fertility rate (TFR) of the rural residents is 4.2 percent while in case of urban residents, it is 3.2 percent (PDHS, 2013). Determinants across different districts of Punjab are important to study because population growth in Punjab is higher than other provinces. There are innumerable factors like socioeconomic and demographic determinants that are thought to be accountable for the differentials in fertility of the regions. This paper attempts to highlight some socio-economic and demographic determinants, causing differentials in fertility. Under-five mortality, employment rate and contraceptive use are important determining factor of fertility differentials through the districts of Punjab.

Forty six percent of female population is in reproductive age. Population that is under 20 years comprises more than half of the total population. Similarly, a significant proportion of girls in the Punjab province are married in their teens and also start childbearing in that age. Forty per cent children are born within 24 months of the birth of an older sibling. A large proportion of pregnancies are unintended and unplanned. This puts women's health at greater risk through early childbearing.

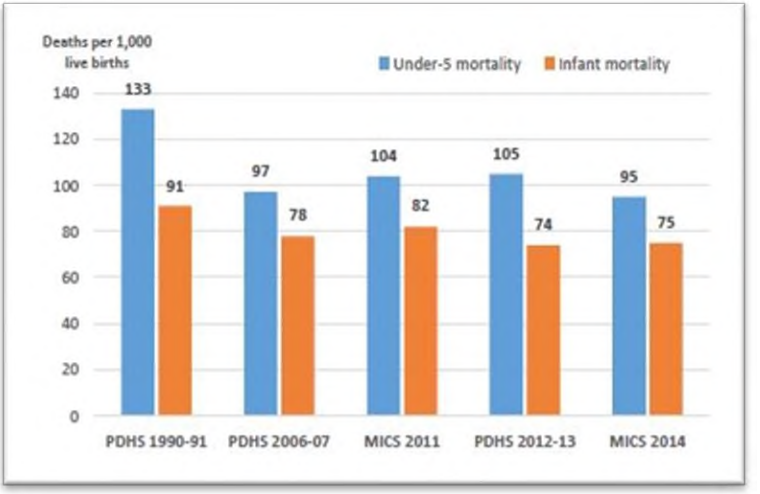
The country comprises of five provinces. The five provinces are Punjab, Sindh, KPK, Gilgit Baltistan and Baluchistan. Punjab is the utmost populated region of Pakistan and accounts almost 56 per cent of the population followed by Sindh. KPK is the third with regard to population and Baluchistan comes in last.

Figure 1: Distribution of Total Fertility Rate among Districts of Punjab Province.



Source: Author's Calculation.

Figure 2: Overtime Variations in Under-5 Mortality & Mortality Rates from 1990-2014.



Source: Multiple Indicator Cluster Survey (MICS).

In Figure 2 the variations in the recent Multiple Indicator Cluster Survey 2014 is compared with MICS 2011 Punjab and Pakistan Demographic and Health Survey (PDHS) 2012-13. Throughout previous four years the MICS estimations point out a decrease in infant and child mortality.

1.2. Aim of the Study

The present study will explore the fertility trends at districts level in Punjab. Conferring to the 6th population and housing census 2017, population of Pakistan has increased to 207.7 million, showing 57 per cent increase from earlier census in 1998. An average annual population growth rate is 2.4 per cent over a period of 1998-2017. This population increase is a heavy burden on Pakistan economy. It cannot sustain this burden that's why there is a dire need to handle this issue. Birth rates are declining but the pace of decline is slow. In Punjab province, this issue becomes more severe because Punjab is the densely populated province of Pakistan. Punjab's population reached 110.1 million according to census of 2017. There is a need to figure out the reasons and determinants for high population and high fertility rates and to observe the type of relationship between fertility and other socio-economic and demographic determinants. That's why there is a dire need to study the factors behind this persistent high fertility and to factor out the most important determinant. Very little is explored about fertility differentials at district level in Punjab, Pakistan.

1.3. Objectives of Study

- To rank the districts on the basis of total fertility rate and income inequality.
- To discover the influence of income inequality on fertility differential for districts of Punjab.
- To provide policy implications.

2. Review of Literature

Various socioeconomic and demographic researchers examined significance of differentials of fertility through time and regions. Previous research explored influence of various channels of female status i.e., female educational level and labour force participation on fertility is examined. In

this research, labour force participation, under-five mortality rate and contraceptive usage are analysed to find out the differentials in fertility across districts of Punjab, Pakistan.

Economic development has always been linked with variables of population growth though population appeared as an exogenous variables in some models. The classical demographic transition theory reexamined by Coale Hoover (1958) and Hirschmans (1958), all showed that there existed causal linkages between these two sets of interacting variables. Similarly, in Leibenstains' model of economic development (Leibenstain 1954), population appeared as an integrated endogenous variable. Nelson's model built around three basic variables (Nelson, 1956) i.e., income investment and population growth showed how low income countries of the world are caught up in vicious low income equilibrium trap, where improvement in income per head can only be sustained if rate of capital formation can outgrow population growth.

Population growth itself depends on many interacting variables. Fertility and mortality rates being fundamental as out migration does not tend to fluctuate population growth rates significantly beyond distorting the age-sex composition of the native population. From these two variables, fertility rates are more complex in nature being the resultant of a series of economic, social and cultural factors. It is possible (though quite difficult to maintain) to bring about reductions in mortality rates by means of massive epidemic eradication and other public health programs but this is not so in the case of fertility rates. Economic development itself exerts influence on many variables of fertility for example it brings about higher income, improve literacy rates, urbanization, higher female participation rates in the labor forces. Also with economic development, reorganization of the family structure takes place. Children no longer remain economic assets as in a primitive agrarian society but become economic liability in the changing industrial economy which require higher specialized labor requiring long period of training and investment in human capital. All these factors pulling themselves in the same direction tend to lower fertility rates eventually. (Chaudhary, 1976)

A number of studies conducted in India also indicated that high formal female educational level was related with low fertility. A study (Chandrasekharan, 1954) revealed that completed size of the family for unbroken marriages up to the age of 45 was six or higher for illiterate, primary school and middle school women in Banglore. It was five for females having higher educational level and two for female having college or university level education.

Becker (1960) exhibited an economic framework to investigate the determinants affecting fertility. Children were considered to be durable good particularly that produce income to parents. Determining factors of fertility were child costs, knowledge, income, uncertainty, and tastes. Demand of children will increase due to reduction in price and increase in income. Quality of the children was precisely associated with quantity disbursed over them. Every household produced their children as children cannot be bought or sold in marketplace. So uncertainty in the production of children (i.e. sex) ultimately created corresponding uncertainty in consumption. That's why the quantity of children in a particular family depended upon its demand as well as its ability to produce or supply them. Some families are unable to produce as many children as they desired and some have to produce more than they desired. Therefore, actual fertility may diverge considerably from desired fertility.

A research study was conducted by Irma Adleman, (Adleman, 1963) in which age-specific birth rates in various countries of the world (The sample consisted of 37 countries whose annual per capita income ranges from $125 to $1900) were correlated with several economic and socio-cultural variables such as urbanization, industrialization and education over the long run. The validity of this cross-country approach was tested by computing separate regression equations- one for developed and the other for the under-developed countries. No statistically significant differences in regression coefficients emerged, which indicated that the basic postulate of the cross section technique i.e. homogeneity of population response was satisfied. This study showed that mothers' level of education exerts significant influence upon child bearing behavior. Her analysis showed a

clear inverse correlation between educational years of wife and family size. Since there existed no international data on educational index for female. The regression coefficient of birth rates, with respect to the educational index was found negative and statistically significant. Quantitatively, among all the variables, a one percentage change in the index of education appeared to exert the largest absolute influence upon age-specific birth rates.

A study (as cited in Agarwala 1972) showed mean number of children born to families of age fifteen and above conducted in Banglore City who were either illiterate or could barely read and write or those who were educated up to middle school were very nearly the same that in between 5.3 and 5.5 children. However, women who were educated up to high school or more gave birth to only 3.9 children. Part of the difference was due to higher marriage age of those who were educated up to high school or more. But when the averages were standardized by duration and age of marriage, the difference between the two groups persisted.

However, Siegel (2012) observed that during previous thirty years the US total fertility rate is properly constant while female wages had continuously raise. He perceived that females' hour spent on housekeeping have dropped but men's have improved.

Ushie (2014) considered fertility differentials in two settlements which included Anantigha as an urban settlement in Calabar and Bendi as a rural settlement in Obanliku. The population sample of 900 households was used that was consisting of married men and women. Findings showed that both settlements had same variation in age entry to marriage even though there was a significant difference in fertility differentials in the study area.

Reja and Mukherjee (2015) worked on overall fertility levels among three Asian countries namely Bangladesh, India and Indonesia. They found that total Fertility Rate was declining gradually within and across the countries but the pace of decline varied.

Vogl (2015) studied variations in fertility and human capital over the demographic transition. The results suggested that associations between income and fertility were hump-shaped in the beginning. With economically developed, top of hump shifted to left, and ability circulation shifted to right, this makes the link of income or skill with fertility to move from positive to negative.

Kim (2016) stated that better-educated females have lesser children than low levels of education of women in both developed as well as developing countries. The reason for this was the benefits of education beyond the value of women's time. Education could reduce fertility because better-educated women earned more and might raise their children more effectively.

Yasmeen (2016) intended to obtain coherent forecasts for the age-specific fertility for Pakistan of the two broader areas, urban and rural. She used Coherent Functional Models for mortality forecasting. Results have shown that, on average, rural females had greater fertility rates comparing with their urban dwellers in all age-groups since 1984. Substantial negative association among percentage of urban inhabitants and fertility rate lead to the result that change in reproductive behavior among the females of two polar mostly from alterations in the socio-economic circumstances, especially from variances in the level of education, literacy rate and age at marriage. Forecasts of future fertility rates showed that these differences were expected to be maintained over the next twenty years. The results were reliable with the findings of Yasmeen Fatima and Mahmood (2014), Yasmeen F and Mahmood Z (2012) and Hyndman R & Khandakar Y (2008) that the overall fertility rates were decreasing.

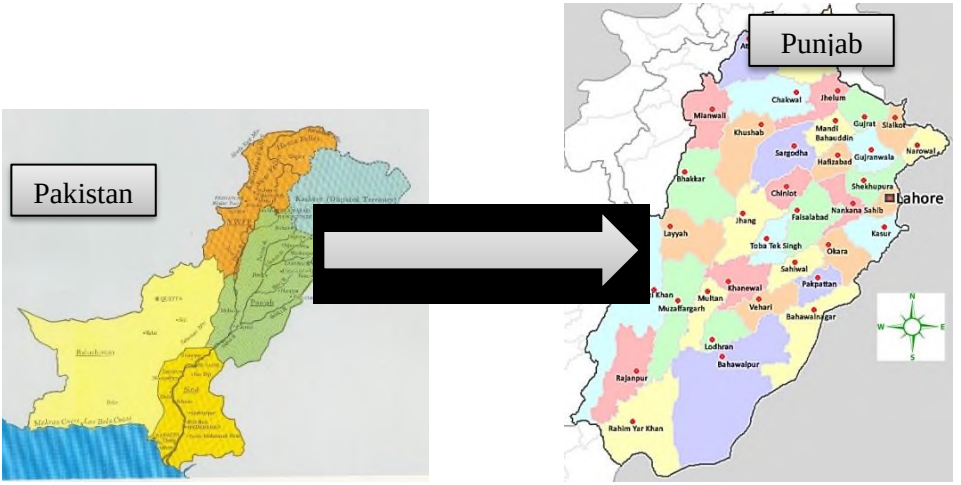
A variation in fertility between urban and rural populations had been explored by Khan (2013) for Punjab and specifically Bahawalpur district and also looked into the reasons of fertility variations between them. Computation and comparison of fertility levels for all of the concerned urban and rural areas showed the fertility gap between them which highlighted the notable differences in fertility rate of both the areas. The

difference in reproduction behavior result in an opposite relationship among percentage of urban inhabitants and fertility rate which actually come from the socio-economic differences particularly the differences in education level, rate of literacy and marriage age. The focus is proposed to be on rural areas for policy formulation and implementation, since most of the population was settled there in case of Punjab.

3. Methodology

3.1. Study Area

Pakistan mainly consists of Punjab, Sindh, Khyber Pakhtun Khaw, Baluchistan, Azad Jammu and Kashmir and Gilgit Baltistan. Though, major province is Punjab according to its population size, establishes 29 percent reported area, forms 55 percent population and constitute 57 percent of cultivated area and 69 percent of cropped area for agricultural production of the country (Government of Punjab 2016).



3.2. Description and Data Source

This study used dataset of Multiple Indicator Cluster Survey 2013-14 conducted and disseminated by Bureau of Statistics, Government of the Punjab (2016) with the collaboration of UNICEF. Household data for MICS 2017-18 is not available yet so that's why the study is study last available dataset of MICS 2013-14. Dependent variable is Total Fertility

Rate, whereas income inequality at district level of Punjab province of Pakistan is used as independent variable in the model. Data for total income of households is taken from Multiple Indicator Cluster Survey (MICS, 2013-14). Income inequality for thirty six districts of Punjab is calculated by Mean Log Deviation. Stata 12 is used for data analysis.

3.3. Econometric Modeling

By definition, linear regression deals with the linear relationships among dependent and independent variables. That's why, it assumes there is a straight-line relationship between them. Least square regression is undoubtedly a useful and important technique.

Ordinary Least Square (OLS) method is used to estimate the model. The model is given below:

$$TFR_d = f\,(MLD_d, U5M_d, UN_d, CPT_d)$$

$$TFR_d = \alpha_d + \beta_0\, MLD_d + \beta_1 U5M_d + \beta_2\, UN_d + \beta_3\, CPT_d + \varepsilon_d$$

Here;

TFR = Total Fertility Rate of d^{th} district.

MLD = Coefficient of Inequality of d^{th} district.

U5M = Under-5 Mortality of d^{th} district

UN = Unemployment Rate of d^{th} district

CPT = Contraceptive Use of d^{th} district

ε_d = *Error Term*

d = 1, 2, 3, ……. , 36.

4. Results and Discussion

This section clarifies the achieved outcomes as reported by objectives of the present paper. Though, formation of this section will be in a way given below:

4.1. District Ranking

4.2. Frequency Tables

4.3. Econometric Model

4.1. District Ranking

Table-1: District Ranking of Total Fertility Rate (TFR)

Rank	District	TFR	Rank	District	TFR	Rank	District	TFR
1	Rajanpur	6.2	13	Multan	3.6	25	Mianwali	3.3
2	D.G.Khan	4.9	14	Layyah	3.5	26	Chiniot	3.2
3	Muzaffargarh	4.6	15	Nankana sahib	3.5	27	Mandi Bahauddin	3.1
4	Kasur	4.5	16	Sheikhupura	3.5	28	Sialkot	3.1
5	Narowal	4.3	17	Bahawalnagar	3.4	29	Lahore	3.1
6	Lodhran	3.9	18	Faisalabad	3.4	30	Rawalpindi	3.1
7	Sahiwal	3.9	19	Khanewal	3.4	31	Attock	3
8	Bhakkar	3.9	20	RahimYKhan	3.3	32	Gujrat	2.9
9	Bahawalpur	3.8	21	T.T.Singh	3.3	33	Vehari	2.8
10	Okara	3.8	22	Gujranwala	3.3	34	Chakwal	2.7
11	Jhang	3.7	23	Hafizabad	3.3	35	Sargodha	2.6
12	Pakpattan	3.7	24	Khushab	3.3	36	Jhelum	2.3

Source: Author's Calculation.

Table 1 demonstrates rank and position of total fertility rate for the districts of Punjab according to total fertility rate. This is obvious from the above Table that Rajanpur, D. G. Khan and Muzaffargarh are the most populated districts with highest fertility rate. While Bahawalnagar, Faisalabad, Khanewal and RahimYar Khan are having the moderate total fertility rates. Chakwal, Sargodha and Jhelum are the least populated districts with lowest fertility rate in Punjab.

Table-2: District Ranking of Income Inequality.

Rank	Districts	Income Inequality	Rank	Districts	Income Inequality
1	Jhelum	0.2301	19	Sahiwal	0.4638
2	Attok	0.2955	20	Mandibahauddin	0.4890
3	Rawalpindi	0.3203	21	Okara	0.4898
4	Chakwal	0.3631	22	Nankana sahib	0.2476
5	Sheikhupura	0.2508	23	Vehari	0.3030
6	Hafizabad	0.2605	24	Multan	0.3286
7	Narowal	0.2641	25	Bahawalpur	0.4225
8	Sargodha	0.2642	26	Bahawalnagar	0.5065

9	Gujranwala	0.2723	27	Khanewal	0.5110
10	Lahore	0.2880	28	Lodhran	0.5229
11	Chiniot	0.3038	29	Rahimykhan	0.5759
12	Faisalabad	0.3052	30	Layyah	0.2878
13	Gujrat	0.3211	31	Mianwali	0.4069
14	Tobateksingh	0.3227	32	Bhakkar	0.4517
15	Pakpattan	0.3365	33	Khushab	0.4772
16	Sialkot	0.3486	34	Muzaffargarh	0.6685
17	Jhang	0.3811	35	Deragkhan	0.7251
18	Kasur	0.3912	36	Rajanpur	0.8226

Source: Author's Calculation.

4.2. Frequency Tables

Parametric as well as non-parametric approaches both have advantages and disadvantages also. Non-Parametric approach is more data intensive and henceforth might be more appropriate even in case of large data set. Though, this does not necessitates a defined functional form and might not imposed of certain assumptions. Conversely, parametric approach may not be flexible in its nature as it requires any well-defined functional form (Singh, 2010).

Now the question arises that should the level of fertility in Northern low income inequality group is similar to the level in central low inequality set? Likewise, would the level of mortality and literacy rate for all four regions with high income inequality be the same or not? This serious issue is handled in this section.

Table 1: Frequency distribution of districts controlling for regional effects

Regions	Inequality Score	
	High (0.45+)	Low (<0.45)
North	0	4
Center	3	14
South	4	4
West	2	5
Total Districts	10	26

Source: Author's Calculation.

In Table 1, sample distribution of all four regions is presented according to inequality level. Inequality among these regions is calculated by mean log deviation (MLD). Then all four regions are assigned high and low inequality score. Districts are divided under high income inequality group and low income inequality group. In north Punjab no district falls in the group of high income inequality group and all four districts lie in low income inequality group. In central Punjab, total districts are 17, from which 3 districts falls in high income inequality set and 14 districts lies in low income inequality group. In southern Punjab, 4 districts are in high income inequality group and four lies in low income inequality group. Total 07 districts are included in western Punjab from which only two are fell in high income inequality category.

In this step, mean fertility rate is calculated controlling for regional effects. Mean fertility rate is 2.8 for North having low income inequality. It is revealed that low income inequality has compressed the size of mean fertility rate. So, we can say that in equality contributed to small family size. Districts of central, southern and western Punjab that have low inequality also have low mean fertility rate but the district that falls in high income inequality category have high mean fertility rate. This indicated that low inequality is good for small family size.

Table 2: Mean fertility rate by regional income inequality

Regions	Inequality Score	
	High (0.45+)	Low (<0.45)
North	0	(2.8) 4
Center	(3.6) 3	(3.4)14
South	(3.5) 4	(3.4) 4
West	(4.6) 5	(3.4) 2

Source: Author's Calculation.

Table 3: Mean under-five mortality rate by regional income inequality

Regions	Inequality Score	
	High (0.45+)	Low (<0.45)

North	0	(65.5) 4
Center	(114.66) 3	(95.85)14
South	(112.25) 4	(101.25) 4
West	(105.2) 5	(80) 2

Source: Author's Calculation.

Low inequality results in low mean under-five mortality rate. Districts with low inequality score have low levels of mean under five mortality rates that is 65.5. Districts of all four regions having low income inequality also have low mean under-five mortality rate. But the districts that are having high inequality score have high mean under-five mortality rate and fertility rate as mentioned in the table. For South and West Punjab, the difference in mean under-five mortality rate between low and high income inequality groups with each group is as larger as that between them.

Table 4: Mean female literacy rate by regional income inequality

Regions	Inequality Score	
	High (0.45+)	Low (<0.45)
North	0	(41.2) 4
Center	(41.36) 3	(51.97)14
South	(34.95) 4	(49.3) 4
West	(56.64) 5	(60.55) 2

Source: Author's Calculation.

Since high income inequality results low mean female literacy rates. It is assumed that others effects remain the same, the greater the income inequality score, lesser will be the average literacy rates. Put differently, lower the income inequality, higher would be the mean literacy rates as a whole.

In other words, although under-five mortality rates and level of education are two important mechanisms through which economic development translates itself in reducing a country's fertility level, the four tables

presented here demonstrates the importance of income inequality in determining the level of these two variables.

4.3. Econometric Analysis

Total fertility rate for thirty six districts of Punjab is taken as dependent variable. Coefficient of Mean Log Deviation calculated and is considered as an independent variable to check the effect of distribution of income on fertility rates.

Table 5: Inequality and Fertility Model

Dependent Variable: Total Fertility Rate				
Independent Variables	Coefficient	Std.Error	t-stat	Prob. value
U5M	.008794	.0043	2.04	0.050
Unemp	.114141	.0424	2.69	0.011
Contr	-.031975	.0130	-2.45	0.020
Coef.Ineq	.947579	.6838	1.39	0.176
Constant	-7.03117	4.040	-1.74	0.092
R-sq.	0.5121	F-stat	8.13	
Adj R-sq.	0.4492	Prob.	0.0001	

Source: Author's Calculation.

Table 5 shows the positive effect of income inequality upon the level of fertility. This is a significant outcome for the reason that till now, we are observing at the influence of income and wealth of a country's fertility without taking into account the nature of the distribution of economic resources.

Empirical results of econometric model indicate that under-five mortality has significant and positive relationship with total fertility among districts of Punjab. With the 1 level increase in mortality rate, total fertility rate will be increased by .0087 level. Probability value shows that Under-five mortality rate is significant at 95 percent. Coefficient of Inequality is positive and significant with total fertility rate. With 1 level increase in inequality, total fertility rate will be increased by .94 levels. Probability

value shows that Coefficient of inequality is significant at 83 percent. Contraceptive use has negative but significant relationship with total fertility rate. With 1 level increase in contraceptive use, total fertility rate will be decreased by .03 levels. Probability value shows that contraceptive use is significant at 98 percent. All variables have significant probability values having significant relationship with total fertility.

5. Conclusion and Policy Implications

Concluding the paper, cross sectional empirical analysis was incorporated to explore effect of various socioeconomic determinants on fertility for the districts of Punjab. In the empirical analysis, total fertility rate is considered as outcome variable whereas income inequality, employment rate, under-five mortality and contraceptive use were considered as independent variables. The lessons obtained from the findings of the paper are given as: Firstly, empirical results of this study indicate that contraceptive use has negative relationship and significant association with total fertility rate. Results are associated with empirical indication on the association between contraceptive usage and fertility as is shown by Gupta 2003 and Bongaarts 1978. Result shows that contraceptive use in Societies like Pakistan is mainly for gap purpose and not for ending family size. Couples used contraceptives after completing their ideal number of children. It is the fact that fertility plans of Pakistani couples are very high. Religion may also be the reason as the finding is proved by Bhatti 2015. On the whole, contraceptive use has strong impact on fertility rates.

Secondly, the employment rate employs statistically significant and positive influence on fertility as is proved by Hakim 1994 and Bloom 2009. Thirdly, according to the results of this study, reduction in under-five mortality might be supportive to decrease fertility for the districts of Punjab. It is found that under-five mortality has substantial relationship with fertility. Lesser under-five mortality leads to lesser fertility rates.

Lastly, income inequality has positive relationship with total fertility rate and significant variable in determining fertility rate. Inequality of income

affects socioeconomic status of poor families which has significant influence on child development. So that's why low income inequality at districts results in low fertility rates and high child development.

It is suggested for the policy recommendation that development in human capital particularly females welfare through child health and contraceptive knowledge might the greatest policy choice to decrease fertility levels amongst various districts of Punjab. It is recommended that governmental setting up of social services regarding to child healthiness and contraceptive knowledge may enhance social welfare and child life expectancy that may be beneficial to decrease fertility levels.

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Probing Crimes, Ethnic Diversity, Institutional Quality and Economic Misery in Pakistan

*Nawaz Ahmad & **Saqib Amin

Abstract: Pakistan's economy has been vulnerable due to sharp rise in crime rate, terrorism along with coexisted inflation and unemployment, so called economic misery for the last many decades. Covering time series data from 1984 to 2014 and by using Autoregressive Distributed Lags (ARDL) techniques, study explores the above nexus. The findings reveals that economic misery, ethnic diversity has significant positive impact on crime rates and quality of institutions shows significant negative impact on crime rate, while GDP per capita has nothing to do with crime due to economic misery instead of distributional of income impact.

Keywords: Economic Misery, Ethnicity Diversity, Crime, Institutions, Time Series Analysis, Household Consumption
JEL Classification: D02, C22, E21.

1. Introduction

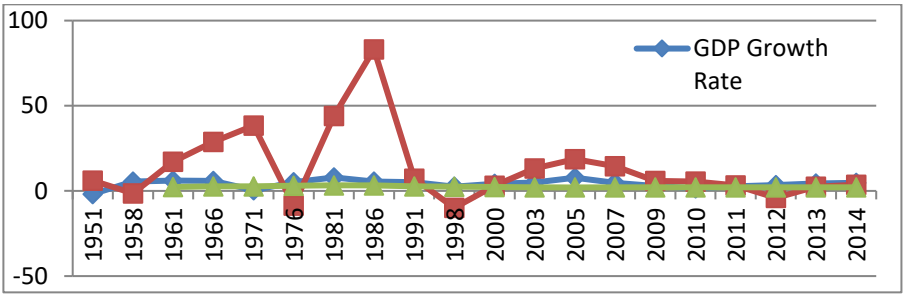
Crime is not less than a challenge now days for developing countries like Pakistan as it has been aggravating for last many decades. Political instability, high crime rate, terrorism and religious extremism in various shapes with severity are present in Pakistan for the last many decades. Political instability, extremism and terrorism are under critical observation and being tackled now a days. But to address high crime rate is a serious and demanding issue that emerges not from economic problems only, but also due to consistently deterioration of institutional quality, poor implementation of rule of law and ethnic problems. Ethnic diversity can be considered as "groups of those people which are different in cast, color, culture, nature and religion." A strong relationship has been observed between ethnic diversity and crime (Ellis, Beaver, & Wright, 2009; Hooghe & de Vroome, 2016), in different geographical areas with diverse intensity. The degree of crime rates level and its different causes vary intensively in heterogeneous communities than those of similar communities, Ellis et al (2009). Whereas its intensity is less in homogenous communities because

of strong social ties (Bellair, 1997).

Crime rate may vary across nations with a severity in types of crime among nations. However, its causal relation between interaction and social contacts may vary among nations. Becker (1968) concluded that ethnic criminology is rooted from the ideology of socially excluded people and due to economic issues such as unemployment, low wages. Moreover, different integrated problems of immigrant are one of the many causes. Few social scientists are of the view that those compatible countries sharing their borders, support good economic policies to frame up society, because socially cohesive society favors quality of institutions endogenously, and thus lead to the development of country (Banerjee et al., 2005; Easterly, 2006b). Other group of scholars are not optimistic about any endogenous institutional change as above argued because developing countries lacks some preconditions for possible occurrence of good governance, and thus so vulnerable and have artificial borders which could easily be split from society into groups, finally create hindrance in implementation of development policies and good governance due to evolving problems from ethnic diversity. Politician often exploit ethnic groups to snatch resources away from other groups to their own group, thus emerge economic inequalities. Therefore, economic channels of crime are interlinked with social channels, however the degree of association may vary across countries, depending level of ethnic diversity, institutional quality and economic inequality, which ultimately instigate people to go for crime.

Pakistan is 6th most populous country in the world and carries large area which makes 36th position in the world with respect to area. Through the history, Pakistan has been facing multiple challenges such as economic and political instability, terrorism and extremism of religion type, moreover debt burden, poverty retarded economic growth badly or often remained volatile due to bad governess low saving and foreign direct investment. These factors added oil on fire.

Figure 1: Trends of Crime Growth Rate, Population Growth Rate and GDP Growth Rate of Pakistan



Source: Compiled by the authors, Data taken from World Development Indicator (WDI), PBS

One can observe volatility in crime rate significantly and in mid- 80 it was highest but after the year 2005 growth rate of crime dropped down until 2011. Corruption is the curse in society and leads to misuse of resources, forgery, fraud and creation of hidden economy which ultimately generates the problem of balance of payments and term of trade for Pakistan. Recent shape of circular debt is the consequence of corruption also.

Insecurity is a cause of low foreign investment in Pakistan and this factor led to shift of industries capital away from the country. Pakistan observes blend of feudalistic, landlords and capitalist system, where they do not accept anything against their interests ultimately significant number of people are deprived of basic economic needs and human rights.

Deteriorating law and orders situation, poor institutional quality, aggravated poverty are making crime situation so rigorous. Magnitude of ethnic based diversity is very significant as compared to other type of diversity in Pakistan.. These ethnic groups are involved in several types of crimes like ethnic based killing, robbery, dacoit, burglaries, theft, kidnapping for ransom etc. In Karachi, there is large number of socio-economic issues generated from the conflict among different ethnic groups and thus rising crime rate in city. Almost 30% of the crimes remained unregistered. Determine the causes of crime is not simple and easy task where a large number of ethnic groups exist. It is obvious, that high crime rate is a hurdle in the way of a sustainability and development of an economy. There is huge gap and unexplored literature regarding the nexus among ethnic diversity, institutional quality, economic growth and crime rate in case of Pakistan, and even globally short of studies available. Previous studies have focused on socio-economic determinants of crime by

ignoring the role of ethnic diversity and economic misery altogether, particularly for the case of Pakistan. This study incorporates ethnic diversity by using the methodology of (Alesina, 2003) parallel with economic misery i.e. inflation and unemployment. This study is unique effort that highlights practical insights of the theory of economics of crime in relation with economic misery, ethnicity diversity and institutional quality by using Autoregressive Distributed Lags (ARDL) model. Present study takes into account annual data for the period of 1980 to 2014 in case of Pakistan.

This study follows the following sequence: first section covers introductory part of study, the second section highlights the previous studies, section third is insight of theoretical background of the study, data analysis and methodology, next sections provides discussion of results. Finally section five accomplishes with the policy suggestion in the light of results.

2. Literature Review

Economics of crime covered by Becker (1968) in the article entitled "Essays in the economics of crimes and punishment." Ehrlich (1973) drawn his attention on the Becker's study by including the variables of income levels and their distribution effects. Hooghe and de Vroome (2016) found on significant association between fear of crime and crime to occur, whereas the ethnic diversity behaves positively with fear of crime. The other dimension of crime i.e economic misery has been explored in the studies of (Saboor, Sadiq, Khan, and Hameed, 2016) that, according to the Okun's misery index, people are threefold miserable in democratic regime than that the regime of monocracy. Whereas the Barrow's misery index model verifies that people are twice worsening in quasi democratic periods. Enamorado, López-Calva, Rodríguez-Castelán, and Winkler (2016) concluded that income inequality responded positively and significantly effect on crime. Cohen, Ferretti, and McIntosh (2014) pointed out misery index as a statistic measure for the level of a population's economic depression by decomposing the expectations-augmented Phillip's curve and Okun's law. Rehavi and Starr (2014) captured criminal aspect of deprivation and discrimination in the sentenced they were given. Their study found black guilty suffers 10 percent longer imprisonment than the

white people under the same crimes. Other interesting fact is that fine imposed discrimination, was also higher on black arresters than the white arresters which is 1.75 times more.

Piraee and Barzegar (2011) examined the relationship between the misery index and the crime rate to determine the motivational and opportunity effects of the misery index in Iran. This study concluded a long-run relationship between property crimes and misery index and also found two-way causality among willful murder, bribery, forgery, indecent commitments, embezzlement, stealing and the misery index.

Tang and Lean (2009) used misery index for American economy for the period of 1960-2005 to see its effects on crime and found positive relationship between them. Moreover, decrease in the unemployment rate would indirectly increase the inflation rate (due to the trade-off Phillips curve effect) and may eventually increase the crime rate. Piquero and Brame (2008) found that black people commit more crime. The study also found no significance relationship in arrested rate on racial and ethnic basic and crime.

Otu and Horton (2005) showed a study on ethnic diversity and crime and finding exposed that reduction in ethnicity differential reduces crime rate. Sampson and Lauritsen (1997) found black were more inclined in criminal activities, burglary and murders than white people. Ralston (1999) observed that inflation and crime rates have positive association. Devine et al. (1988) recognized the cause of crime rate is an inflation because low income periods or hard times instigate and intensify criminal behavior and reduce the deterrence against crime.

Aurangzeb (2012) considered population, consumption expenditure, literacy and GDP have positive impact on crime rate. However, the electricity crisis and migrants impact fragile but positive on crime rate.
Qadri and Kadri (2011) are of the view that education and health contribute positively in increasing crime whereas misery i.e. inflation and unemployment pose insignificant relationship with crime. While Gillani, Rehman, and Gill (2009) found that unemployment, poverty and inflation had significant positive relationship with crime.

Though, globally there is literature on economic misery, ethnicity diversity, institution and crime, but this dimension has been neglected while linking with crime in case of Pakistan. So, present study caters this dimension by exploring linkages and their impact on crime.

3. Theoretical Framework, Data Sources and Methodology

3.1 Theoretical Framework

Economics of crime in linkage with ethnic diversity, economic misery and institution quality has been debatable. A new debate on the behavior of criminals for committing crimes was initiated by as Becker (1968) and Ehrlich (1973) who explored the reasons of crimes.

Becker's (1968) provides simple logical view, with the increase in input price, cost of economic activities increases, which impact positively on the level of offenses.

$$L = D(O) + C(P, O) + bpfO \ldots\ldots\ldots eq \quad 1$$

Whereas, "D" shows damages arising from crime, "C" is cost of conviction and apprehension "bpfo" cost in the form of social loss from punishments and "L" shows ultimately the loss "L", since "bf" is the loss per offense punished and "p0" is total number of punished offenses. An increase or decrease one's expected utility arising from offence, would reduce the number of offences. This can be expressed as expected utility function of a potential offender as mentioned below

$$EU_i = p_i U_i(Y_i - f_i) + (1 - p_i) U_i(Y_i) \ldots\ldots\ldots\ldots\ldots\ldots eq \quad 2$$

Whereas, $\mathbf{Y_i}$ represents income from an offence, $\mathbf{U_i}$ represents utility function, $\mathbf{f_i}$ represents his monetary equivalent of the punishment. Becker (1968), the relevant variables appears differently from person to person due to personal heterogeneity. Following aforementioned theory and study of Han (2009), which considers, property crimes, violence crime, kidnaping, murder etc. This study takes total crime by adding these categories and adds up some important socioeconomics variables for empirical analysis i.e.

ethnic diversity. The functional form of the model is as under,

Crime = F (Economic Misery, Ethnicity Diversity, Institution, GDP per capita, Household Consumption) …..3

$$\text{Logcrm}_t = \alpha_0 + \beta_1(\text{Emis})_t + \beta_2(\text{Eth})_t + \beta_3(\text{Ins})_t + \beta_4(\text{Gdpp})_t. + \beta_5(\text{Hc})_t \quad \text{…..4}$$

Economic Misery captures economic rationale for crime to occur, while ethnic diversity is taken to cover social side. Many studies have provided the role of ethnic diversity to impact crime, when some people are socially excluded from society and they are deprived of basic rights in employment and other business of life. When resources are diverted to some groups of people at the cost of other groups of people, this also leads to crime. Therefore ethnic groups whether religious or linguistic, when ignored they incline towards crime. Role of institution is taken deterrence variable because weak institutions leads to more crimes. While household consumption is chosen because it shows society standard of living and demonstration effect that leads to crime because of positive association between them.

3.2 Data Source

Crime includes murder, attempted murder, kidnapping/abduction, child lifting, dacoit, robbery, burglary, cattle theft, other theft and others miscellaneous crime. The data for all reported cases of crimes published Pakistan Bureau of Statistics, 50-Years Book of Pakistan and Pakistan Statistical Year Books (various issues) taken by this study. The data for ethnicity diversity was taken from the Cline Center for Democracy Data Base. This study has adopted methodology of Alesina et al. (2003) for ethnic diversity on linguistic basis by using the following formula.

$$\text{FRACT}_j = 1 - \sum_{i=1}^{N} S_{ij}^2 \ldots\ldots \text{eq} \qquad 5$$

Whereas, $\mathbf{S_{ij}}$ is the share of each group i, (i=1……N) in the country j (means Pakistan) in all groups. The range of this index is between 0-1. Zero "0"

shows complete homogenous country and "1" shows absolute heterogeneous country. Economic misery is the combination of inflation and unemployment i.e. (Economic misery = inflation rate + unemployment rate). Data of inflation and unemployment rate is taken from IMF and WDI. Data of institution is taken from International Country Risk Guide (ICRG) and through applying principal component analysis (PCA) this study generated index to create variable of institutional quality, whereas data for GDP per capita i.e. in log form and household consumption as a percentage of GDP extracted from the website of world development indicator (WDI). The data period for the present study is from 1984 to 2014.

3.3 Methodology

Basic condition of using time series is to check unit root problem first and in the absence of this problem OLS regression may be applied.

To encounter this problem of time trend in underlying variables is tested with analysis of unit root and then study uses ARDL to investigate long run relationship. ARDL bounds testing approach was first developed by Pesaran, Shin, and Smith (1999) and later extended by Pesaran, Shin, and Smith (2001). The ARDL bound testing approach can be applied without the restriction of order of integration of variables. ARDL bounds testing approach (Pesaran et al., 2001) also involves estimating the Unrestricted Error Correction Model (URECM) for determining short run relationship. ARDL error correction representation can be applied, if F-Statistics confirms long run relationship (Nkoro and Uko, 2016)

$$\Delta \mathrm{Logcrm}_t\ \alpha_0 + \beta_1 (\mathrm{Logcrm})_{t-1} + \beta_2 (\mathrm{Eth})_{t-1} + \beta_3 (\mathrm{Emis})_{t-1} + \beta_4 (\mathrm{Ins})_{t-1} + \beta_5 (\mathrm{Gdpp})_{t-1} + \beta_6 (\mathrm{Hc})_{t-1} + \sum_{t=1}^{p} \phi_i \Delta (\mathrm{Logcrm})_{t-1} + \sum_{t=0}^{q} \omega_i \Delta (\mathrm{Eth})_{t-1} + \sum_{t=0}^{q} \gamma_i \Delta (\mathrm{Emis})_{t-1} + \sum_{t=0}^{q} \delta_i \Delta (\mathrm{Ins})_{t-1} + \sum_{t=0}^{q} \varphi_i \Delta (\mathrm{Gdpp})_{t-1} + \sum_{t=0}^{q} \vartheta_i \Delta (\mathrm{Hc})_{t-1} + \varepsilon_t \quad \ldots\ldots\ldots \quad 6$$

Whereas, $\boldsymbol{\alpha_0}$is drift, $\boldsymbol{\varepsilon_t}$ is the error term, $\boldsymbol{\beta_i}$are the short-run coefficients, Δ is the first difference operator and p and q are optimal lag lengths (which may vary from variable to variable) and Logcrm, Eth, Emis, Ins, Gdpp and

Hc are Log of total reported crime cases, ethnicity diversity, economic misery, institution, GDP per capita and household consumption respectively. The F test is used for testing the existence of long-run relationship i.e. cointegration. The "Null Hypothesis" for no co-integration among variables in equation (6) is H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$ against the "Alternative Hypothesis" H_1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$. The long run relationship among the variables can be expressed in equation form are as under:

$$\text{Logcrm}_t = \alpha_0 + \sum_{t=1}^{i=p1} \phi_i \, (\text{Logcrm})_{t-1} + \sum_{t=0}^{i=q1} \beta_1 \, (\text{Eth})_{t-1} + \sum_{t=0}^{i=q2} \beta_2 \, (\text{Emis})_{t-1} + \sum_{t=0}^{i=q3} \beta_3 \, (\text{Ins})_{t-1} + \sum_{t=0}^{i=q4} \beta_4 \, (\text{Gdpp})_{t-1} + \sum_{t=0}^{i=q5} \beta_5 \, (\text{Hc})_{t-1} + \varepsilon_t \quad \text{.....eq} \quad 7$$

The orders of the lags in the ARDL model are selected by following the Akaike Information Criterion (AIC) and the Schwarz Bayesian Criterion (SBC), i.e 2, before study proceeds for long run relationship. The ARDL specification of the short-run dynamics can be derived by constructing an Error Correction Model (ECM) of the following form:

$$\Delta\text{Logcrm}_t = \alpha_0 + \sum_{t=1}^{1=p} \phi_i \, \Delta \, (\text{Logcrm})_{t-1} + \sum_{t=0}^{i=q1} \omega_i \Delta \, (\text{Eth})_{t-1} + \sum_{t=0}^{i=q2} \gamma_i \Delta \, (\text{Emis})_{t-1} + \sum_{t=0}^{i=q3} \delta_i \Delta \, (\text{Ins})_{t-1} + \sum_{t=0}^{i=q4} \varphi_i \Delta \, (\text{Gdpp})_{t-1} + \sum_{t=0}^{i=q5} \vartheta_i \Delta \, (\text{Hc})_{t-1} + \psi \text{ECM}_{t-1} + \varepsilon_t \text{.....eq} \quad 8$$

Where ECM_{t-1} is the error correction term, defined as

$$\text{ECM}_t = \text{Logcrm}_{t-1}\alpha_0 - \sum_{t=1}^{i=p1} \beta_1 \, (\text{Logcrm})_{t-1} - \sum_{t=0}^{i=q1} \beta_2 \, (\text{Eth})_{t-1} - \sum_{t=0}^{i=q2} \beta_3 \, (\text{Emis})_{t-1} - \sum_{t=0}^{i=q3} \beta_4 \, (\text{Ins})_{t-1} - \sum_{t=0}^{i=q4} \beta_5 \, (\text{Gdpp})_{t-1} - \sum_{t=0}^{i=q5} \beta_6 \, (\text{Hc})_{t-1} \quad \text{.....eq} \quad 9$$

All coefficients of short-run equations show short run dynamics of the model, convergence to equilibrium and value of ECT represents the speed of adjustment.

4. Empirical Results

Table 1: Test for Unit Root

Variables	ADF without trend		ADF with trend		PP without trend		PP with trend	
	Test Statistic		Test Statistic		Test Statistic		Test Statistic	
	At level	1st difference	At level	1st difference	At level	1st difference	At level	1st difference
Log of Crime	-0.9108*	-5.5938***	-2.5198*	-5.5267***	-0.9345*	-5.6550***	-2.632518*	-5.5836***
Ethnicity Diversity	-2.5604	-2.3640**	-0.5575	-3.1934**	-0.8206	-1.7439**	-0.806347	-2.6115**
Economic Misery	-2.5788*	-7.5530***	-3.2664*	-7.4261***	-2.4754*	-7.5530***	-3.265266*	-7.4261***
Institution	-1.7377	-4.7187***	-1.8474	-4.6394***	-1.9416	-4.7408***	-2.118869	-4.6650***
LGDP	0.7869	-5.1911***	-1.2334	-1.2334***	0.7698	-5.1918***	-1.233466	-5.7116***
HC	-1.7637	-6.9836***	-1.7815	-7.6333***	-1.7184	-6.8749***	-1.659500	-7.6333***

Source: Author's Calculation. *represents significant level of 0.10(10%), ** significance level of 0.05(5%) and *** as the significance level of 0.01(1%). ADF and PP represents the Augmented Dickey Fuller and Phillip Perron tests for stationary, with and without trend, at level and first difference.

Table 1 shows the robust results regarding the unit root of the variables. To know the stationarity of each variable, study followed both criteria i.e.

Augmented Dickey Fuller (ADF) and Phillip Perron (PP) unit root methodology. Table 1 depicts that all the variables are stationary at level I(0) and first difference I(1). The null hypothesis of both the tests confirms that no unit root exists in the series. All the variables have mixed order of integration I(1) and I(0) and none of integrated at I(2), thus ARDL testing can be proceeded for further implementation of co-integration for knowing long run relationship among the variables.

Table 2: Result of Bound F-testing

Critical Values Bounds			F-Calculated
Significance	Lower Bound I(0)	Upper Bound I(1)	
10%	2.72	3.77	6.754885
5%	3.23	4.35	
2.5%	3.69	4.89	
1%	4.29	5.61	

Source: Author's own calculations

Table 2 shows the result of bound testing approach to observe whether cointegration exist by considering Bound test of Pesaran et al. (2001). According to critical value of Pesaran, the upper bound value is 5.61, 4.89, 4.35 and 3.77 at 1%, 2.5%, 5% and 10% level of significance respectively. Whereas the values of F-statistics is 6.754, which is higher than the critical upper bound value at 1%, 2.5%, 5% and 10% level of significance using restricted intercept and no trend. The value of F-statistics indicates overall significant of the model by establishing cointegration and long run relationship among the variables.

Table 3: Estimate Long Run Coefficients by using ARDL Approach With Lag length (1,1,1,2,1,2)

Variable	**Total Crime Equation**
ETH	3.930224***
	0.361703
EMIS	0.013181***
	0.002316
INS	-0.019142***
	0.004313

HC	0.005758*
	0.002866
LGDP	0.106655
	0.084904
C	1.666859***
	0.274627
R^2	0.992607
Adjusted R^2	0.982751

Notes: Each column presents the results from separate regression. The standard errors in parentheses.***Shows the 1% significance of coefficients, ** Shows the 5% significance of coefficients, * Shows the 10% significance of coefficient.

Table 3 reveals that ethnicity diversity as most important driver impacts the crime rates positively with the coefficient of 3.9 means 1 % increase in ethnic diversity will increase crime by 3.9 %, when people are socially excluded. The study shows similar results as past literature found positive and significant relationship between ethnicity diversity and crime, see: (Martinez Jr, Martinez, & Valenzuela Jr, 2006; Patacchini & Zenou, 2012; Sampson & Lauritsen, 1997). Economic Misery has direct positive relationship with crime rate, and 1% increase in economic misery, increases crime rate by .013 %. These results are also similar to the study of Cohen et al. (2014); Piraee and Barzegar (2011); Tang and Lean (2009). Whereas, Institution has negative significant relationship with crime rate that decreases crime rate by .019 % with the 1 % increase in institutional performance. Household consumption has positive and significant relationship with crime rate i.e. 1 % increase in household consumption increases crime by 0.005 %. which supports the result of previous literature see studies of (Aurangzeb, 2012; Hicks & Hicks, 2014). This study also explores positive relationship between crime rate and household consumption. GDP per capita provides insignificant but positive relationship with crime rate. There has been a unique but not surprising relationship between GDP per capita and crime rate. As GDP per capita increases the capacity of individual for committing crime also increases see the studies of (Fajnzylber, Lederman, & Loayza, 2002; Klaer & Northrup, 2014). Some study found reverse results that as GDP per capita decreases the crime rate increases (Ahmad, Ali, & Ahmad, 2014).

Table 4 Error Correction Representation for the Selected ARDL Model

Variable	Total Crime Equation
ETH	(43.198156)
	26.635603
EMIS	(0.002353)
	0.002045
INS	-(0.003403)
	0.005387
HC	(0.008287)
	0.004794
LGDP	(0.153502)
	0.119166
CointEq(-1)	(-1.439235)***
	0.294732

( ) represents coefficent ***Shows the 1%, 5% and 10% significance level

The ECT (Error Correction Term) value indicates that model converges in short run to long run equilibrium with a change of ethnicity diversity, economic misery, institution, GDP per capita and household consumption.

Table 5 Diagnostic Tests of Total Crime Equation

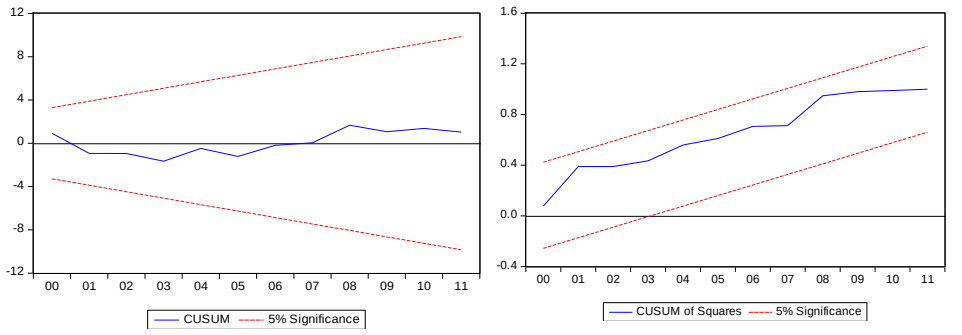
	Crime Equation	
Test Statistics	**LM Version**	**F Version**
Serial Correlation	2.217316	F(2,12) 0.1515*
Normality	0.092331	Not applicable*
Heteroscedasticity	0.490530	F(25,14) 0.9417*

*shows 95% confidence interval.

Table 5 represents the various diagnostic tests to check the validity of ARDL model. The result indicates that there is no problem of serial correlation and heterosecedasticity in the model. Whereas the value of LM version and F-version are more than 0.05, which show null hypothesis (existence of Serial correlation) is rejected against the alternative hypothesis of non-existence of serial correlation. The results of

heterosecedasticity also indicate that error term is normally distributed, and there is no problem of heterosecedasticity.

Figure 2 Diagnostic Graphs for Stability (CUSUM & CUSUMQ)



The straight lines represent critical bounds at 5% significance, whereas the residual line within the critical bounds shows the Cumulative Sum of Recursive Residuals and Cumulative Sum of Squares of Recursive Residuals regarding stability of the ARDL model.

5. Conclusion & Policy Implications

This study used ARDL approach to show long run relationship between crime rate, economic misery, ethnic diversity and institutions. The estimated results of the study reveal the significant and positive relationship of ethnic diversity with crime rate in long run. It means that widened diversity of ethnicity is a cause of crime in long run (Patacchini & Zenou, 2012; Sampson & Lauritsen, 1997). Economic misery also shows positive relationship with crime because economic misery decreases income and brings down the costs of committing crime for unemployed people which ultimately motivate individuals to commit crime (Cameron, 2014; Gillani et al., 2009; Khan, Ahmed, Nawaz, & Zaman, 2015). Most of the literature (Abdul Hamid, Habibullah, & Mohd Noor, 2012; Gillani et al., 2009; Khan et al., 2015) shows that there is positive relationship between unemployment and crime in Pakistan and in rest of the world. Institutional

quality has negative impact on crime rate because strong institutions are profound hindrance in the way of crime occurrence. When a criminal perceives that he cannot be rid of after crime, he avoids the criminal acts. This study suggests that diversity cannot be condensed; however, its severe effects can be lessened by social inclusion and providing equal opportunity to all the individuals of the society and establishing a cohesive society. Further, it is need of time to ensure rule of law and order without discriminations of ethnic groups and have to formulate stagflation counter policies in the country, because inflation and unemployment increase economic misery.

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Economic Growth, Obesity and Global Burden of Disease: An Exploration

*Rizwan Azam & **Alvina Sabah Idrees

Abstract: In recent years, obesity has increased in the emerging economies to a level. Economic growth plays an important role in increasing the obesity in a country. The present study is an attempt to examine the effect of economic growth in the increasing obesity and its relationship with global burden of disease. To carry out this study different regions are taken like south Asia, Latin America and Caribbean, Europe and central Asia, North Africa and Middle east and Sub Saharan African. Economic performance is measured through GDP. Obesity is measured through the calories intake per day by a person in these regions. Total health spending, out of pocket spendings share of health spending, development assistance as share of total health spending, diabetes and hypertension are included as variables. To examine the relationship, graphs of all these variable are made and comparison has been done for these regions. The results show that GDP growth or economic growth has a significant impact in increasing ratio of obesity. As economic growth increases, per capita income of people also increases. People have more money to spend on food and their food shift from low calories to high calories. Excess of calories changes into fat by the body and then this fat converted into obesity. Due to obesity different diseases create like diabetes and hypertension due to which mortality rate also increases. So obesity is also a cause of increasing the global burden of diseases. Furthermore, it has been suggested that the government of these regions should encourages the people by teaching them about obesity in institutions.

Keywords: Obesity, Food, Disease, Economic Growth, Health
JEL Classification: I18, O40, L66

1. Introduction

Human and planetary wellbeing and additionally monetary development are immovably interlinked and subject to complex cooperation impacts. In this study we give a review of interlinkages between economic growth and obesity through its impact on global burden of disease. Obesity is a medicinal condition which is because of abundance of fat. Because of

*The author is a Graduate of Department of Economics, Government College University Lahore
**The author is a Lecturer at Government College University Lahore

abundance of fat, individuals contracted by various maladies which may abandon them to have a lower standard of health. Individuals are by and large viewed as hefty when their body mass is more than 30 kg/m2.

Individuals inside the range of 25–30 kg/m2 depicted as overweight. Heftiness has achieved plague degrees universally, with more than 1 billion grown-ups overweight and more than 300 million of them are clinically obese and is the significant supporter of the worldwide weight of malady. The real ailments which expanded by corpulence are hypertension, diabetes, different sort of cancers.

Simon Kuznets' (1955) theory that as a nation builds up, a natural cycle creates where disparity initially expands then decrease has turned out to be known as the Kuznets curve. This concept can be related with health Kuznets curve which is an inverted U-shaped pattern between economic growth and income related health inequalities. As economic development occur, health inequalities increases first then decrease. As GDP of a country increase, people will have more money to spend and consume more calories due to which obesity rates increase. However as income continuously rising, health become more important for the people and they decrease their obesity level. A group of researchers showed that when emerging trends such as a rise in obesity rates at all ages, are taken in account, forecasts of future life expectancy is lower than they would have been otherwise. Obesity is more in developed countries but now the trend of obesity spread along the worldwide.

Obesity has a diverse effect on the economy of a country. High developed countries have more obese people than developing countries. The key causes are associated with expanded utilization of energy dense food with high level of fat and reduce physical activities. High calorie food is not the only factor which make the people of a developed country obese. Lots of thing responsible to make people obese. Researchers tries to show that the effect of technology like TV and computers screens. The statistics shows that every 10 % increase in a country spend on technology give 1% rise to the obesity.

A country with most of obese people pay different type of costs like health cost, productivity cost and transportation cost. Due to obesity people caught by different type of diseases and government expenditures increases on health sector which is burden on the economy because many other sector may deprive from their share of money and this bad for an economy. The writing around there incorporates investigations of the total productivity loss because of obesity, and also gauges for a few particular sub-classes of efficiency costs. People did not work with their full efficiency due to obesity and produce less which is a direct cost paid by economy. So economy of a country may fall down.

Notwithstanding its effect on restorative spending and productivity, obesity may influence transportation costs. Increments in body weight among Americans imply that more fuel and bigger vehicles are expected to transport a similar number of suburbanites and voyagers every year. This delivers an immediate cost and additionally potential aberrant expenses as more noteworthy ozone harming substance discharges. Obesity rates in developing countries are low but now a days increases due to the cultural changes. Urbanization phenomena is also linked with obesity in the sense that it will change the environment and the most important diet of the people and this phenomena is more in developing countries. Obesity increases in developing countries but not more than developed countries. As economy of a country effected as obesity increases so both are interlinked.

The issue of obesity can be overcome if people avoid to take sugar and refined carbohydrates and by using more fruits, vegetables, nuts and whole grains. People must do exercise at least 30 mint in a day and use vegetables base instead of animal based fats. Economic performances can be increased by lowering the obesity.

1.1 Problem Statement

The economy and obesity are interlinked with each other. Obesity has increased drastically over the past few years which has poses serious implications on economy. Indicators like health, productivity and GDP plays a significant role in assessing the burden of obesity in the economy of a country. Developed countries are more victim of obesity but now a day due to cultural change and urbanization in the sense that it will change the environment and the most important diet of the people. So this study is

designed to examine the impact of obesity on economic growth in developed countries and developing countries. Does economic growth impact the body mass? How obesity is related with global burden of disease?

1.2 Objectives of the Study

The study has the following main objectives:

1) To examine the impact of economic growth on calories intake per day
2) To assess the impact of obesity on global burden of disease

1.3 Significance of the Study

In this study the impact of obesity in the economy and comparison of obesity in developed and developing country is analyzed. It is sensible to portray obesity as a general health disaster that seriously weakens the health and personal satisfaction of individuals and adds impressively to national medicinal services spending plans. Due to obesity economy produce low but pay a direct cost in the form of treatment of diseases produced by obesity which is a burden on the economy. This study will help the government to design polices which are most suitable according to need to prevent obesity.

1.4 Limitations

The present study started the data collection process including the developed and developing countries but excluded missing values for some countries therefore, the data was trimmed. This study includes the data of different regions like South Asia, Sub Saharan Africa, North Africa and Middle East, Latin America and Caribbean and Europe and Central Asia. It has limitation of data availability on obesity for some countries.

1.5 Organization

The remaining part of the study is divided into various sections as: chapter 2 presents a review of the literature and related research linked with the

problem presented in the study. Chapter 3 provides a theoretical framework of the study. Chapter 4 explains methodology. Chapter 5 consists on the presentation of the outcomes. Chapter 6 presents a summary and discussion of the researcher's conclusion and suggestions for practice.

2. Literature Review

Samanic, et al. (2003) investigated the obesity and disease hazard among white and dark United States veterans. To decide if corpulence related tumor dangers varied essentially amongst white and dark men, it is discovered that heterogeneity is a hazard for every malignancy site by including a communication term for weight. Results demonstrated that dangers were fundamentally raised for a few diseases among white and dark veterans. Corpulent men are at expanded danger of real malignancies.

Barid, et al. (2005) attempted to study the relationship between growth and subsequent obesity and to determine if any association has been stable over time. Search are done about studies that described the relation between aspect of infant size and the obesity at any later stage. Result shows infants who are at the highest end of the distribution for body mass index or who grow rapidly during infancy are at increased risk of obesity.

Pickett, et al. (2005) endeavored to discover if there exist any connection amongst obesity and day by day calorie intake with salary imbalance among created nations. Top 21 created nations having information on salary disparities and obesity would be examined. The outcome demonstrated weight, diabetes, mortality and calorie utilization were related with salary imbalance in created nations. Expanded nourishing issues might be a result of the psychosocial effect of living in a more various leveled society.

Asfaw (2006) examined the impact of obesity on specialist diagnosed ceaseless ailments in Africa. Information in this examination from 2002 world health review supported by the world health organization was utilized. Multivariate fidelity investigation was performed. The outcome demonstrated that corpulent people were at a higher danger of detailing diagnosed unending ailment especially coronary illness in South Africa than non-hefty partners.

Olsen, et al. (2006) tried to investigate the birth cohort effect on the obesity epidemic in Denmark in the prevalence of obesity among boys and young

men. Trends in the prevalence of obesity from 1930 through 1999 expressing time as the subject year of measurement and as year of birth was examined. The result showed trends in the prevalence of obesity were similar in boys and young men only when expressed by year of birth which suggests that early life may be a period for developing obesity.

Riemenschneider, et al. (2008) analyzed cost estimates and compare cost attributes to obesity across different European countries. A search in MEDLINE, EMBAS and EBM reviews was conducted to identify relevant literature. The result showed that overweight and obesity are responsible for a substantial economic burden in Europe. Rapidly growing prevalence of over nutrition in industrialized nations, further increase in cost is expected.

Gultekin, et al. (2009) examined the prevalence and patterns of adult obesity in Turkey and discuss the impact of socio environmental factors. A cross sectional nationwide survey was conducted on 2100 adults including males and females. The results showed that obesity was more remarkable among females than males. Logistic regression analysis showed that older age level among males and females have impact on obesity.

Musaiger (2011) attempted to investigate the pervasiveness of weight among various age bunches and in addition factors that connected with corpulence in the Eastern Mediterranean area. The investigation of distributed papers in the vicinity of 1920 and 2011 utilizing Medline information base and WHO data base was carried out. Results demonstrates that stoutness has turned into a pandemic in a large portion of nations of the Eastern Mediterranean district and requiring dire to battle this pestilence.

Ezeanochie, et al. (2011) broke down the predominance of maternal weight in early pregnancy and think about the resulting pregnancy result among obese and non-obese in Nigeria. A case control ponder from 2006 to 2008 utilizing a hospital obstetric and perinatal information base was directed. The outcome demonstrated that corpulence in early pregnancy is a hazard factor for unfriendly pregnancy result among pregnant Nigerian ladies.

Mustillo, et al. (2013) analyzed how weight at various ages impact mental pain in late immaturity utilizing longitudinal information on black and white young ladies. Information from the national development and wellbeing study was utilized. Discoveries demonstrated critical proximal and distal impacts of corpulence on mental misery among white young ladies and there were no distal impacts among dark young ladies.

Wadsworth and Pendergast (2014) tried to contemplate how the connection between heftiness and life fulfillment is affected by the commonness of corpulence in the setting in which people are living. Information from the Behavior Risk Factor Surveillance System was utilized. Discoveries demonstrated that heftiness is contrarily connected with life fulfillment. Large people when all is said in done are less happy with their lives than the non-corpulent.

Cunningham, et al. (2014) attempted to locate the national frequency of heftiness among kids in United States. Information from the early childhood longitudinal investigation was utilized. The outcomes demonstrated that episode heftiness will probably have happened at more youthful ages, principally among kids.

Pisa and Pisa (2016) contemplated the pattern between South Africa's economic developments utilizing different economic development pointers with grown-up heftiness over a predetermined timeframe. Information for corpulence from national survey of South Arica led in 1998, 2003 and 2012 was utilized. Economic development markers were acquired from World Bank. Discoveries demonstrated that pattern affiliation exist between South Africa's economic development and grown-up heftiness. As Gini coefficient expanded, stoutness declined and when coefficient diminished heftiness expanded.

Tanzil and Jamil (2016) tried to decide the degree of weight of stoutness as a rising epidemic in Pakistan. The writing survey through PubMed web search tools in regards to stoutness trouble in Pakistan was directed. Results demonstrates that Pakistan is as of now experiencing plague of heftiness influencing all the age gatherings. The weight of heftiness is across the board among grown-ups and kids.

2.1 Marginal value of study

In this literature review, relationship between obesity and growth is described in different countries separately. The present study describes the interlinkages between obesity and growth through its impact on global burden of disease in different regions like south Asia, Latin America and Caribbean, Europe and central Asia, Sub Saharan Africa and North Africa and Middle East. This study describes obesity as a general health disaster that seriously weakens the health and personal satisfaction of individuals and adds impressively to national medicinal services spending plans. Due to obesity economy produce low but pay a direct cost in the form of treatment of diseases produced by obesity which is a burden on the economy. This study will help the government to design polices which are most suitable according to need to prevent obesity.

3. Theoretical Framework

This section explained the detailed theoretical relationship of obesity with economic growth in high income developed countries and low income under developed countries. Diseases from obesity like diabetes and hypertension and the burden of diseases on economy is also described. Due to obesity economy produce low but pay a direct cost in the form of treatment of diseases produced by obesity.

3.1 Explaining the concept of obesity

Stoutness is a restorative condition in which body fat has extended to the extent that it may have negative effect on wellbeing. People are seen as hefty if their body mass record is more noteworthy than 30 kg\m2 and the population with body mass index 25-30 kg\m2 considered as overweight. Corpulence grows the diverse diseases like coronary sickness, diabetes, and certain sorts of growth, hypertension so forth.

Obesity is caused by excessive nourishment intake with high calories and absence of physical work. By and large obese individuals have an incredible vitality expenditures in respect to thin individual because of vitality required to keep up an expanded body mass. Obesity is one of the main source of death in entire world. Various examinations have discovered that mortality chance is bring down at a body mass record of 20-25 kg\m2. A

gathering of analysts demonstrated that while rising patterns, for example, an ascent in obesity rates at all ages, are considered, figures of future life expectancy is lower than they would have been something else.

Obesity is more in improved countries yet now the pattern has spread around the world. In advanced nations individuals utilizes the fast food and don't take work out. Individuals in advanced nations have high pay so they eat more sustenance full with high calories which will lead them towards obesity. Because of obesity their vitality level tumbled down and they cannot partake in economy with full exertion which is not a decent sign for the economy. Obesity is more typical in ladies than men. Specialists post it as a standout amongst the most difficult issues of 21st century.

3.2 The way people in developed countries become highly obese

Individuals in high pay advanced nations have more pay to spend. They utilize the fast food and don't practice and along these lines their physical work diminish. Since individuals have high wage so they eat more nourishment with high calories which will lead them towards obesity. Because of obesity they have chronic sicknesses like diabetes and hypertension because of which their vitality level tumbled down and they cannot partake in the economy with full force. This will put weight on economy in light of the fact that their treatment expenditures will increase. Chronic diseases like cancer which are costly to treat. It likewise expanded the transportation cost. So it has many negative impacts on wellbeing and economy.

Fatty sustenance is not the main factor which make the population of a created nation obese. Heaps of thing responsible to make individuals obese. Specialists tries to demonstrate that the impact of technology like television and PCs screens. The measurements demonstrates that each 10 % expansion in that a nation spend on technology give 1% ascend to the weight. Technology does not keep individuals on their seats however it likewise changes the way individuals eat i.e. including more calories by eating fast food and lessening physical work. The normal individuals in created nations like America watches around four hours of TV for each day. This action connected with obesity or overweight in various investigations.

The study of National Health and Nutrition Examination demonstrates that individuals with overweight and obesity invest more energy before TVs and

PCs and playing computer games than individuals of normal weight. Sitting in front of the TV over two hours in a day additionally have the danger of overweight and corpulence in the youngsters. Issue is that in advanced nation's individuals sitting in front of the TV rather than practice or doing that exercises that consume more calories (International Journal of Obesity, 2008).

Study demonstrates that eating in front of TV likewise a reason of overweight and obesity in the created nations since individuals expends more calories in front of TV. Indeed children will be more dynamic when they won't be sitting in front of the TV. The reason is that the children ate a greater number of snacks when they were sitting in front of the TV than while doing different exercises and this will lead them towards obesity in light of the fact that their physical work diminish. This issue is more in the exceptionally developed nations like United States America and this is the reason there is an expansion in the proportion of obese individuals in late time.

Another argument behind why individuals in high wage created nations are more obese is stress and related issues. Stress is a major issue in the feeling of obesity. For instance, in nowadays individuals do a considerable measure of work and have few vocations. In numerous families father and mother both work which makes harder for them to discover time for families, shopping and eat solid food together in table. We hear in TV news more violent activities by kids. This expands the level of worry in the mind of guardians.

Due to this fear parents allow their children to ride their bikes and to play in the parks. Parents end up driving kids to play dates and structured activities, which means less activity for the kids and more stress for parents. Time pressures for school or family lead people to eat food on the run or to sacrifice sleep. These both things can increase weight. Stress and lack of sleep are closely interconnected to psychological well-being which will also affect diet. Studies have showed that some people eat more when they are affected by depression or emotional disorders. In turn overweight and obesity both will increase emotional disorder.

3.3 Obesity in developing countries

Amid the most recent 30 years economic improvement, natural and social changes have been amazing especially from 1977 to 1999 in the less developed regions of the world. In this period a predictable change in obesity had been found in all developing nations like in sub Saharan African nations. Changes in food in these 30 years have additionally seen regarding increment in fat and meat in developing nations. Urbanization phenomena is likewise connected with weight as it will change nature and the most essential eating routine of the population.

Individuals who are living in rural zones eat crisp sustenance with less calories do physical work. Yet, now a days because of the technological change and industrialization individuals move towards urban territories. This phenomena is more in developing nations. At the point when individuals moved towards urban territories their diet and environment will be changed. They will utilize for the most part fast food with high calories which will put unfriendly impact on them on account of weight. The procedure of urbanization is more in developing nations than advanced. Urbanization is very associated with dietary and hazard components of chronic diseases and most essential with obesity.

In Africa a complex condition of underweight and overweight has been seen. From 1992 to 2005, overweight and obesity increased almost a third in sub Saharan Africa. This increase in obesity in Africa was recently seen in women and urban residents. The rising obesity poses socioeconomic challenges to the region. In 46 WHO African countries 17 countries had 10% prevalence of obesity in women. In 1990 obesity was high in Northern Africa which was 7.5% and in Southern Africa was 6.4%. This increased in obesity in African was due to the closely relation with urbanization. Therefore urban population has high rate of obesity which was 10% rather than rural areas which was 4% in Africa.

Marital status is also an important factor of obesity in sub Saharan African countries. Married people are more obese than non-married. Mogre et al. (2014) showed in a study among medical students found that individual who were married were six time more obese than the individual who are not married. Researchers shows that people who are not married are at a low risk of obesity in Africa. Preferred body size has been linked with

obesity in some of African countries. In these countries obesity is related with good health, beauty, strength and wealth. People preferred their body size to look obese. But now in recent studies this concept is no more.

Unhealthy diet, physical inactivity, smoking and consumption of alcohol are the life style factors of African countries and these factors are linked with overweight and obesity. Consumption of calorie dense food and low use of vegetables and fruits have been related to obesity. People who engaged in different activities were at lower risk of obesity than people who were not engaged in activities. Studies shows that obesity is negatively linked with a person's productivity and performance of work. Obese people will not take part in the economy with full energy and they will want more leisure time which will adversely affect the economy of a country.

The requirement for thinks about on the expanding commonness of obesity in developing nations is more noteworthy now than at any other time as more nations are achieving their development objectives and more individuals are encountering the sustenance and economic progress related with improvement. In this manner, the earth is being set for the indication of chronic diseases identified with adequate vitality accessibility and changes in physical movement related with advancement and urbanization. Obesity is only one of these results but it is additionally connected with numerous other chronic diseases, in this manner aggravating the issue. Noteworthy endeavors must be made to comprehend the etiology of obesity in developing nations and make strategies by which it can be counteracted and controlled in social orders not normally acclimated to managing over nutrition and chronic diseases.

3.4 Linking obesity with economic growth

The prosperity of a country is measured in terms of its annual gross domestic products which has different relationships with papulation level of body weight and happiness. A suitable level of gross domestic product provides a sustainable economic activity, happiness and means level of body mass index. As GDP will increase of a country the economy of that country will also rise. The people of that country will more prosperous.

Many factors effects the economic growth inversely like obesity. Obesity has a direct relation on the growth of economy.

Countries with more obese people have a negative effect on their economy. The reason is that obese people have different kind of chronic diseases like hypertension and different kinds of cancer. Due to obesity their energy level will decrease and they do not take part in the economy with full effort and put a negative effect on the economy. It increased the treatment cost and transportation in a country. Chronic diseases like cancer and diabetes are expensive to treat. So it have many negative effect on economy.

The developed countries like United States America observed a high level of obesity from last few years. One third people were obese. The reason is that in developed countries people eat fast food with high calories which leads them towards obesity. So, obese people want more leisure time because they have low energy level due to different kind of chronic diseases. So this effected the economic growth because people do not take part in economy.

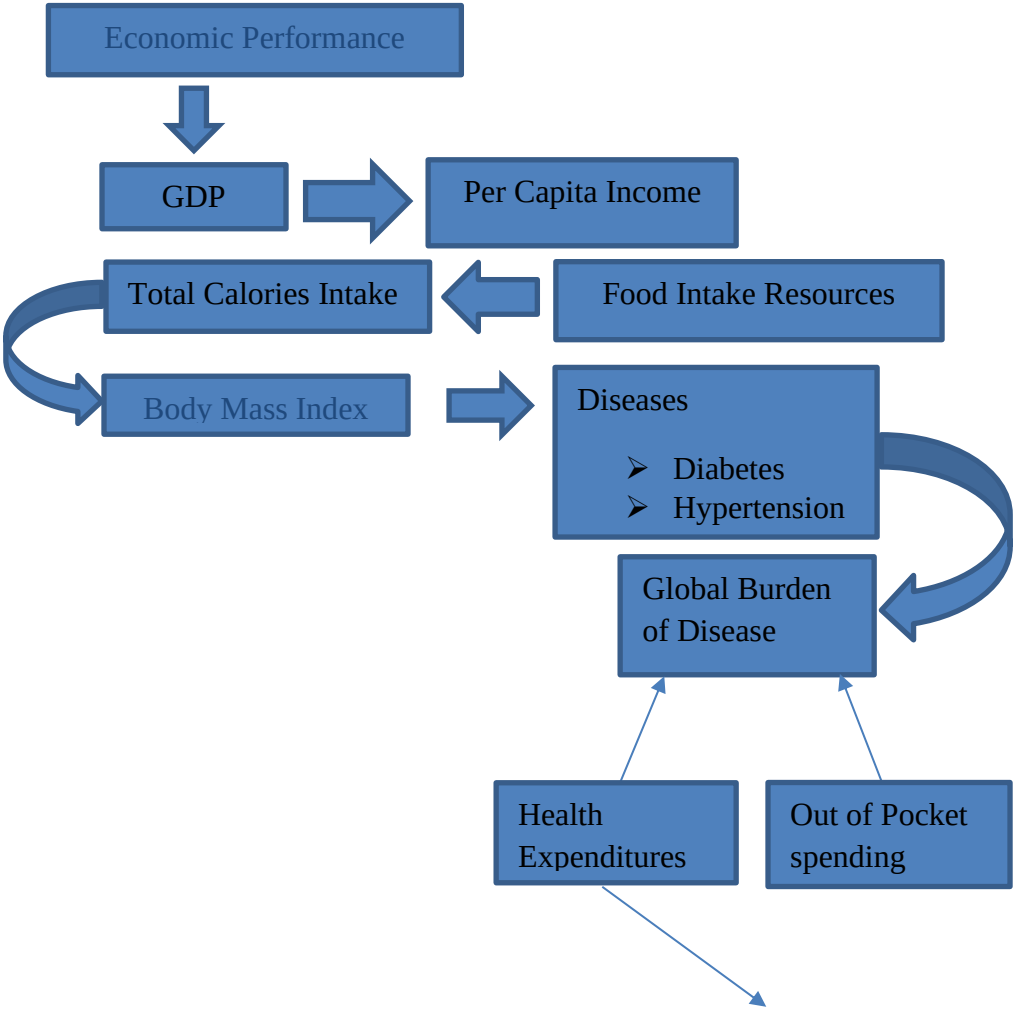
3.5 Obesity and Global Burden of Diseases

The pervasiveness of obesity is expanding at a disturbing rate in many parts of the world. Around 2 billion individuals are overweight and 33% of them are obese. The predicament of the most influenced population, similar to those in high-wage nations in North America, Australasia and Europe, has been all around exposed. In any case, the later increments in population obesity in low-and middle salary nations that are now progressively being watched have been less perceived.

In light of the current commonness and pattern information and the epidemiological proof connecting obesity with a scope of physical and psychosocial wellbeing conditions, it is sensible to portray obesity as a general health disaster that seriously weakens the health and personal satisfaction of individuals and adds impressively to national medicinal services spending plans. The expansion in weight worldwide importantly affects health weakness and lessened personal satisfaction. Specifically, obesity has a vital commitment to the worldwide rate of cardiovascular sickness, diabetes and hypertension. Obesity has a more pronounced effect on dismalness than on mortality.

Another cast that economies have to pay is in the form of low productivity. Due to ill health workers will produce less which will impact his income and the firm's profit. By low production the economy of country will directly affected. Due to obesity economy produce low but pay a direct cast in the form of treatment of diseases produced by obesity. This is the problem mostly in low income or developing countries.

Figure 3.1: Diagrammatic Representation of Theoretical Links



Development Assistance for Health

4. Variables and Data Sources

The research is consisting of two parts. First is comprises of descriptive analysis of variables which can be defined as follow:

Variables

4.1 Economic Growth
4.2 Out of pocket spending as share of total health spending
4.3 Calories per day
4.4 Total health spending
4.5 Development assistance for health as share of total health spending
4.6 Diabetes
4.7 Hypertension

4.1 Economic Growth

Economic growth or GDP growth means that an increase in the amount of goods and services produced by an economy. The total market value of all final goods and services produced in a given year and it is equal to total consumer, government spending and investment plus the value of exports and minus the value of imports. The basic purpose of this study is to analyze the economic growth with obesity through its impact on global burden of disease.

4.2 Out of pocket spending

In the medicinal services and protection businesses, out of pocket costs allude to the segment of the doctor's visit expense that the insurance agency does not cover and that the individual must pay all alone. Out of pocket human services costs are not the same as deductibles. Rather, it is an umbrella term that alludes to deductibles, co-pays and coinsurance.

4.3 Food Calories

Calories are unit of energy. Food calories are defined in terms of kilogram rather than gram. It is equal to 1000 small calories and called kilocalorie. An average woman need 2000 calories in a day and 1500 calories in a week to lose one pound weight but an average man require 2500 calories to maintain and 2000 to lose one pound of weight in a week. Food calories are related with health. People who take high calories daily caught by obesity and then they can suffer from different kind of diseases.

4.4 Total health spending

Total health spending mean how much a country spend on health. Health spending measures the last utilization of medicinal services products and enterprises including individual human services and aggregate services.

4.5 Diabetes and Hypertension

Diabetes is a sickness in which your blood glucose, or glucose, levels are too high. And Hypertension is a condition show when blood courses through the veins with a force more prominent than normal. Values of both diseases are taken between 0 to 100 indexes.

4.6 Development Assistance for health

The measure of research on donor money related help to health, usually called development assistance for health (DAH), has expanded significantly over the most recent decade. Aid flows for health have doubled since 2000s due to the rapid increase in economic growth.

4.7 Data Sources

For this study, data for GDP growth (Annual %) is taken from the world development indicator for the years 1995 to 2016 for the regions like south Asia, Sub Saharan Africa, Europe and central Asia, Latin America and Caribbean and North Africa and Middle East. Data for diseases is taken from WHO study for the global burden of disease for the period of 1995 to 2016. And the data for calories intake per day is taken from Food and Agriculture Organization (FAO) for the year for the year 1992 to 2002. Data

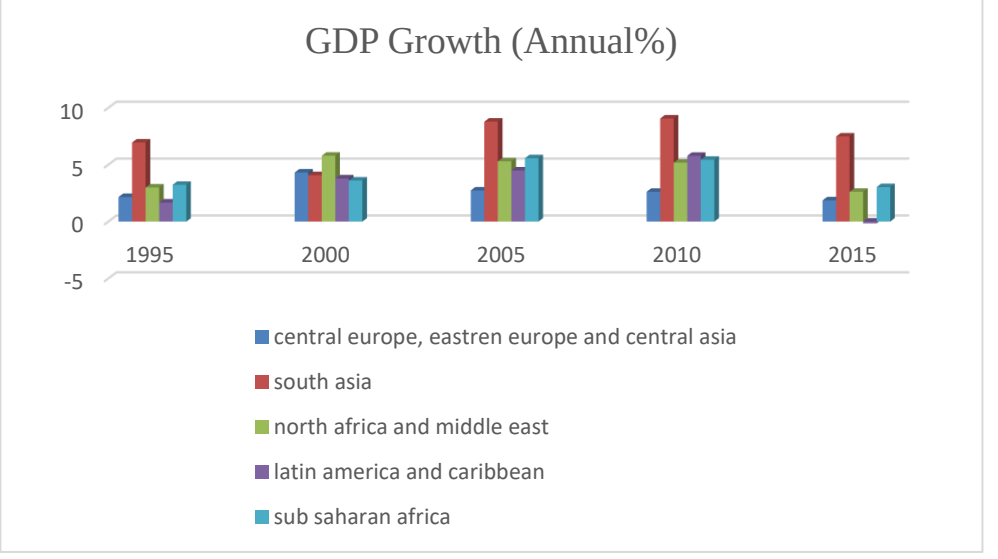
is taken till 2001 for calories intake per day and till 2015 for GDP growth and diseases due to the unavailability of data for some countries.

5. Discussion and Analysis

Economic growth in recent decades has given impressive scope for decreasing appetite and malnutrition. During 1990 and 2010, real per capita earnings grew by about 2 percent for each year universally, in spite of major difference among nations and between decades.

A nation's economic growth is normally demonstrated by an expansion in that nation's GDP or Gross domestic product. Generally, total national output is an economic model that mirrors the estimation of a nation's yield. A nation's Gross domestic product is the aggregate money related estimation of the goods and services created by that nation over a particular time frame. An increase in GDP of a country means that economic growth increase. Due to economic growth per capita income will rise and poverty will also be reduced in developing nations. In this study GDP growth of different regions like Sub Saharan Africa, Latin America and Caribbean, South Asia and North Africa and Middle East is analyzed.

Figure 5.1 GDP Growth (Annual %)



Source: World Development Indicator (WDI), 1995-2015

These all region represents the developing countries. Growth rates for all regions of developing nations were quicker in the 2000s than in the 1990s due to rapid industrialization process, with the most sensational turnarounds occurring in Africa and south Asia. The most fast development rates happened in South Asia due to the rapid growth in some countries like India and China whose growth rates were above 10%. Due to robust growth in India, South Asia demonstrates strength notwithstanding turbulent worldwide markets and remains the quickest developing region in the world, with economic development determined to continuously quicken from 7.1 percent in 2015 to 7.3 percent in 2017 (World Bank, 2016).

According to world bank report (2017) development in Europe and central Asia (ECA) is conjecture to quicken marginally in 2017, after the adjustment of oil costs, profiting the eastern portion of the region, and a proceeded with recuperation in the western portion of the area. After solid economic headwinds in recent year, economies in Europe and central Asia (ECA) are coming back to a more steady development way and the locale is relied upon to grow 1.9 percent in 2017 and 1.8 percent in 2018. Economic growth in Sub Saharan Africa is also expected to be rising 3.2% in 2017 and 3.5% in 2018 due to better commodity price and improved global conditions (World Bank, 2017).

Due to an increase in GDP of a region, per capita income also increase and poverty will reduce in that region. Growth will also create new jobs which will reduce unemployment. Due to growth people have enough money to spend on food and they prefer to eat more food with high calories. High calories will resulted in the form of obesity.

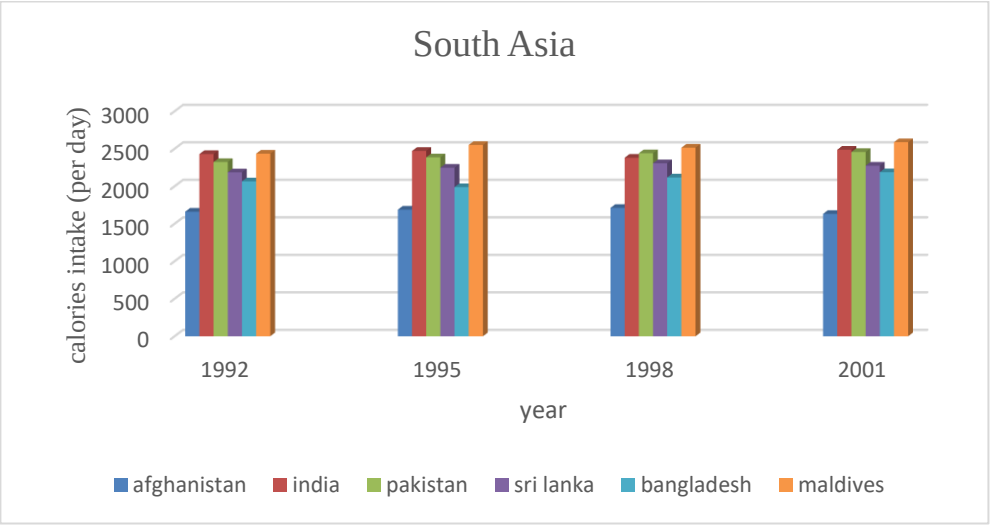
5.1 Trends in Dietary Energy supplies (calories per day)

The 2 % per annum increases in real per capita earnings between the years 1990 and 2010 realized extended enthusiasm for dietary vitality. By and large, for the entire world, dietary energy supplies (DES) extended by around 210 kcal per individual for every day, or 8 percent. The extension was greater in the creating countries 275 (kcal/singular/day) than in the advanced countries 86 (kcal/singular/day). Across the developing countries, the greatest supreme increment 260 to 270 kcal consistently were

in Asia and Latin America and the Caribbean. Gross domestic product development pattern of south Asia and Caribbean area is high than others because of which individuals have more cash to spend on nourishment and they will like to eat high calories sustenance. While the little increment under 130 kcal consistently were in sub-Saharan Africa and Center East where economic advancement was direct. Dietary vitality supplies changes as salary changes in a nation (The State of Food Insecurity in the World, 2012).

Worldwide the use of fruits, vegetables and animal products like fish increased while the use of cereals and roots decreased. By regionally there is contrast between regions which have rapid economic growth with the regions that have slow economic growth. In this study, the graphs of calories intake per day in different regions are made by which the food consumption in these regions can be analyzed.

Figure 5.2 Per Day Calories intake in South Asia

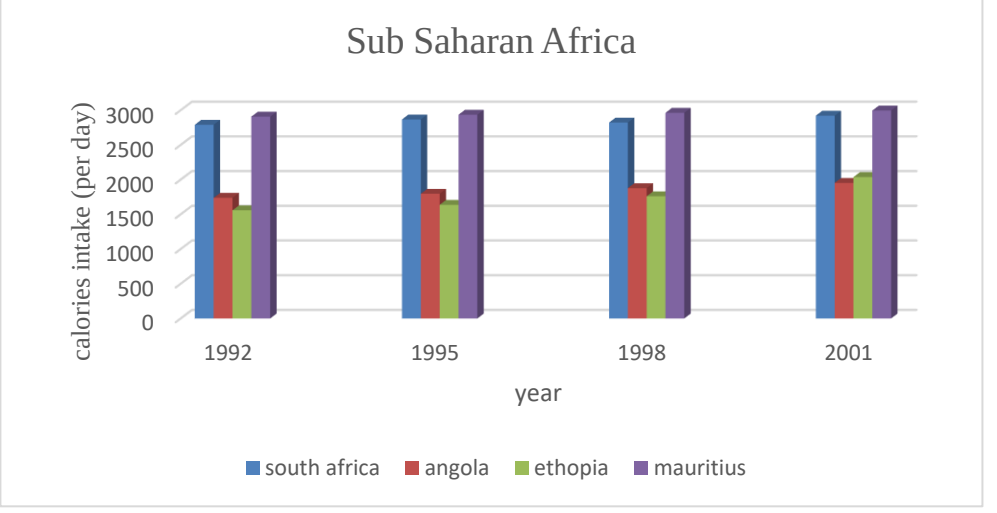


Source: Food and Agriculture Organization (FAO), 1992-2001

In the fast growing Asia calories intake per day by a person increases year by year as the growth rate of the regions increases. Due to the rapid industrialization process in south Asia, GDP growth increased in the countries. So people have more money to spend on food and their food

consumption also change. There is a decline in the dietary energy from cereals and roots and increase in dietary energy from animal source products like fish and meat. Except Afghanistan, all countries in the South Asian region intake high calories because economic growth is more rapid in all these countries than Afghanistan. People of South Asia mostly eat fried food and dairy food. Products made from sugar are also used in high quantities in South Asian countries. The FAO statistical database does not provide information about the distribution of food among countries of a region. As income develop, the contribution of grains, roots and tubers to add up to per capita DES diminishes though the contribution of animal source nourishments and of products of the soil vegetables increment essentially.

Figure 5.3 Per-Day Calories Intake in Sub Saharan Africa



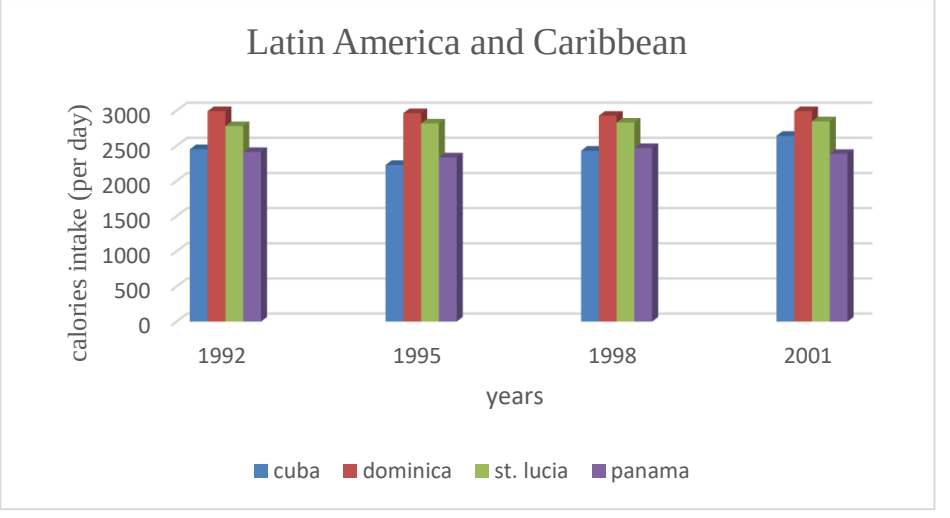
Source: Food and Agriculture Organization (FAO), 1992-2001

In Sub-Saharan Africa, however, dietary energy availability from cereals, roots and tubers increased while dietary energy from animal-source foods and fruits and vegetables was essentially constant. This is the reason that the rate of diseases is low in the Sub-Saharan Africa relative to other regions. Most of the countries in the sub Saharan Africa region have low per capita income due to low GDP growth in this region. So people have

less money to spend on food. Growth in Sub-Saharan Africa is now improving, bolstered by modestly rising item costs, reinforcing outer demand, and the finish of dry season in various nations. Analysis of FAOSTAT (2003) data shows that the per capita supply of calories has remained practically stale in Sub-Saharan Africa and has fallen in the nations in economic move. So due to low GDP growth and low per capita income, most people in sub Saharan Africa region have cereals and root diet energy food.

Development in Sub-Saharan Africa is estimate to get to 2.6 percent in 2017 and to 3.2 percent in 2018, predicated on tolerably rising item costs and changes to handle macroeconomic irregular characteristics. Per capita yield is anticipated to shrivel by 0.1 percent in 2017 and to increment to an unassuming 0.7 percent development pace more than 2018-19. At those rates, growth will be deficient to accomplish poverty reduction objectives in the region, especially if requirements to more lively development hold on (World Bank, 2017).

Figure 5.4 Per-day Calories Intake in Latin America and Caribbean



Source: Food and Agriculture Organization (FAO), 1992-2001

In Latin America and Caribbean region economic growth increased rapidly in 2000s due to which the life style of people of this region also changed as most of people move towards rural areas from urban areas and there is also

a change in the food consumption from low calories diet to high calories diet. Due to improved economic condition hunger has fallen in the region but overweight and obesity are on the increase. While appetite and unhealthiness have fallen, overweight and obesity are on the ascent all through Latin America and the Caribbean, and are especially predominant among ladies and kids, as indicated by another report in 2016 by the Food and Agriculture Organization of United Nation (FAO) and the Pan American Health Organization (PAHO). As per the report, hunger has tumbled to just 5.5 % of the local papulation, yet 23 % are obese and 58 % are overweight.

As income develop, the contribution of grains, roots and tubers to add up to per capita DES diminishes though the contribution of animal source nourishments and of products of the soil vegetables increment essentially. The relative contribution from sugars to general DES is additionally obviously ascending with expanding income in many regions. Utilization of milk per individual has practically multiplied in developing nations, meat and fish utilization has tripled, and egg utilization has expanded by a factor of five. Development has been most grounded in Eastern and South-Eastern Asia and in Latin America and the Caribbean, though it stagnated in Sub-Saharan Africa. The rates of development were for the most part bring down in developed nations, where utilization levels were at that point higher than in developing nations.

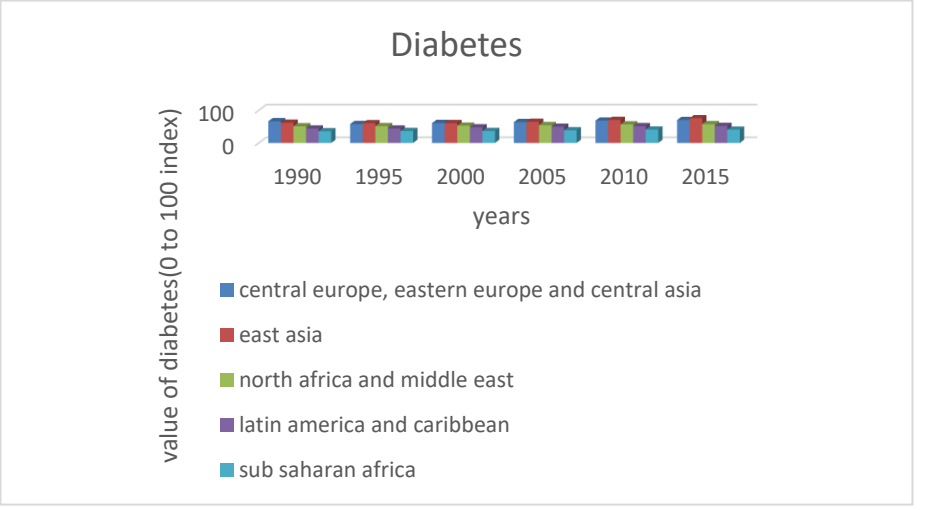
The FAO-WHO Consultative Group on Nutrition (2003) has determined that, on average a daily diet of around 2,200 calories is sufficient to meet basic nutrition needs. But the trends of all these developing nations shows that the average calories intake by a person in a day is more than 2500 in a day. These excessive calories reflect the body mass of a person so people become obese due to extra calories because these extra calories store in the body in the form of fat. People are considered obese if their body mass index is greater than 30 kg\m2 and the people with range 25-30 kg\m2 considered as overweight. Obesity increases the various diseases like heart disease, diabetes, certain types of cancers, hypertension etc.

5.2 Trends of Diseases due to excess of calories

All the developing regions like South Asia, sub Saharan Africa and Latin America and Caribbean have encountered a striking economic development amid most recent two decades alongside ensuing change in social, economic and food frameworks. Rising disposable cash levels keep on driving the nourishment move portrayed by a move from a conventional high carbohydrate, low-fat weight control plans towards diets with a lower carbohydrates and higher extent of soaked fat, sugar and salt. Guided by different moves in statistic, economic and nutritional terms, the population of these regions are encountering a quickly changing disease profile. All these regions are now facing an arising epidemic of obesity and other non-communicable diseases (NCDs). This burden is achieving a genuine health and economic problem and is producing enormous pressure on the economies of these regions.

Diabetes and hypertension are the major diseases produced from obesity (WHO, 2016). All these developing regions are at high risk of diabetes. The rate of diabetes increases year by year in all the developing regions. The high risk of diabetes is linked with changing demographic profile with urbanization and changing life style. . The Framingham Heart Study, an acclaimed study for a long time, evaluated that overabundance body weight including overweight and obesity represented roughly 26 percent of instances of hypertension and diabetes in men and 28 percent in ladies. Obese people have an expansion in greasy tissue that expands their vascular resistance and thusly builds the work the heart needs to do to direct blood all through the body.

Figure 5.5 Trends for Diabetes

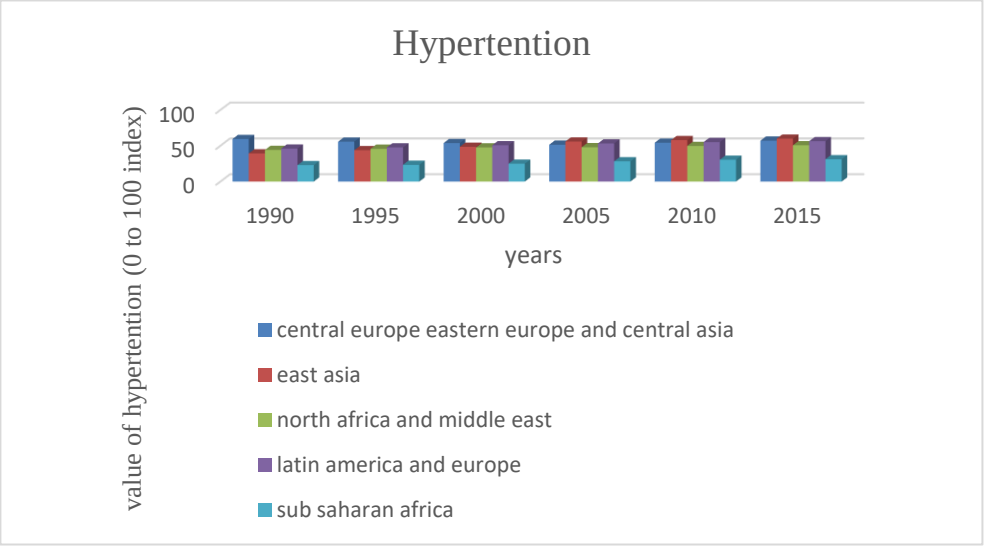


Source: World Health Organization (WHO), 1990-2015

Diabetes represents a lion's share of social insurance costs, as 30% of overweight individuals have the sickness while 85% of diabetics are overweight. The rate of diabetes increases year by year in all the developing regions. Europe and central Asia region has the highest rate of diabetes. In the UK, the National Institute for Health and Care Excellence (NICE), 2014 says in a report that South Asia origin is at a high risk of emerging diabetes due to the having body mass index of 23 or more. As economic growth increases rapidly in South Asia, calories intake per day are increases year by year due to which diabetes increases at constant rate.

But Sub Saharan Africa region has high values of diabetes than South Asia because due to economic growth urbanization process is very fast in this region. The high risk of diabetes is linked with changing demographic profile with urbanization and changing life style. The same procedure is in Latin America and Caribbean region as economic growth increases, calories intake per day also increases in this region and rate of diabetes is increases and average calories intake are more than 2500 per day. By taking more calories obesity generate due to which diabetes also increases (Edwards, 2003).

Figure 5.6 Trends for Hypertension



Source: World Health Organization (WHO), 1990-2015

Hypertension is also a major disease produced by obesity. The Framingham Heart Study, an acclaimed study for a long time, evaluated that overabundance body weight including overweight and obesity represented roughly 26 percent of instances of hypertension in men and 28 percent in ladies. Obese people have an expansion in greasy tissue that expands their vascular resistance and thusly builds the work the heart needs to do to direct blood all through the body.

The rate of hypertension is very high Europe and central Asia region, Latin America and Caribbean and South Asia region. According to World Health Organization (2012) report, in South Asia hypertension is a leading factor for mortality. In south Asia region economic growth is very fast all the countries in this region have high income and they use animal source food mostly. High calorie food mostly used in these regions by which people become obese and disease like hypertension produced. The WHO (2012) report shows that in all these regions hypertension is emerging at high rates year by year. As graph shows that as growth increases in 'Europe and Central Asia' and Latin America regions, calories intake per day is also increases which are much more than calories that are required per day. By consuming more calories obesity increases due to which rates of hypertension also increases and at alarming situation in these regions.

All of these major diseases are the outcome of obesity. A current report assesses that 2.1 billion individuals, almost 30% of the total populace are obese or overweight. The worldwide medical issue is no longer limited to cutting edge nations. Actually, over 60% of the obese population lives in creating nations.

As rising economies keep on industrializing, a resulting increment in income has prompted high caloric intake. In correlation, there are 805 million undernourished individuals on the planet and around 2.5 times more prominent pervasiveness of overweight and obese individuals. As obesity keeps on inclining towards a pestilence, the emergency is not only a health risk but economic risk also. The rapid growth in these diseases increase the health expenses of a country which is a burden on the economy because most of the income of a country spend on health.

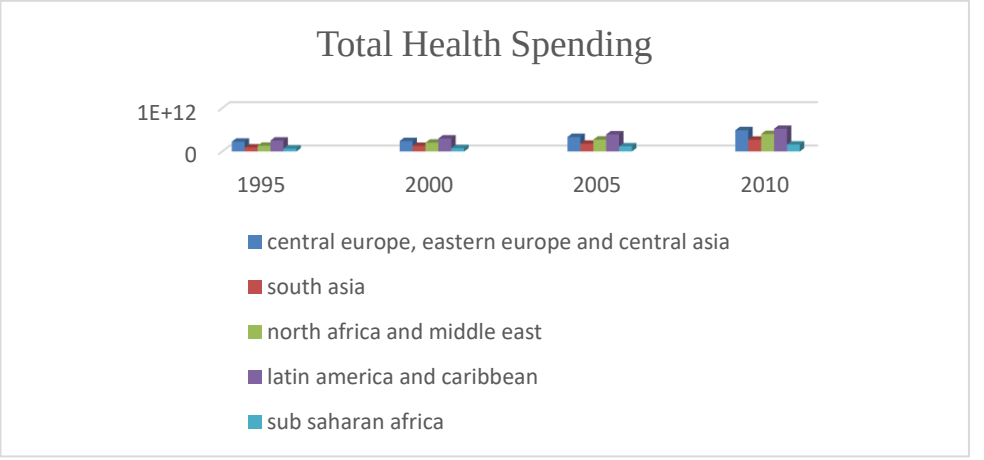
5.3 Economic Incidence in terms of Global Burden of Diseases

When economic growth of a country or a region increases, per capita income of that region also increases. Due to increase in per capita income, life style of the people also changes. Because due to high income most of people move towards urban areas from rural areas and there is also a change in the diet of the people as mostly move towards high calorie diet from low calories diet. Extra calories stored in the body and then converted into fat by the body. This fat then leads the body towards obesity.

Due to obesity some major diseases produced like diabetes and hypertension. Mortality rate and expenditures for treatment increases from these diseases. So as economic growth increases, global burden of disease also increases. Another cost that economies have to pay is in the form of low productivity. Due to ill health workers will produce less which will impact his income and the firm’s profit. By low production the economy of country will directly affected. Due to obesity economy produce low but pay a direct cost in the form of treatment of diseases produced by obesity. This is the problem mostly in low income or developing countries.

Following graphs shows the total health spending, out of pocket spending and development assistance as share of health spending in the different regions. The graph explains how much health spending increases as economic growth increases.

Figure 5.7 Total Health Spending



Source: Institute for Health Metrics and Evaluation (IHME), 1995-2010

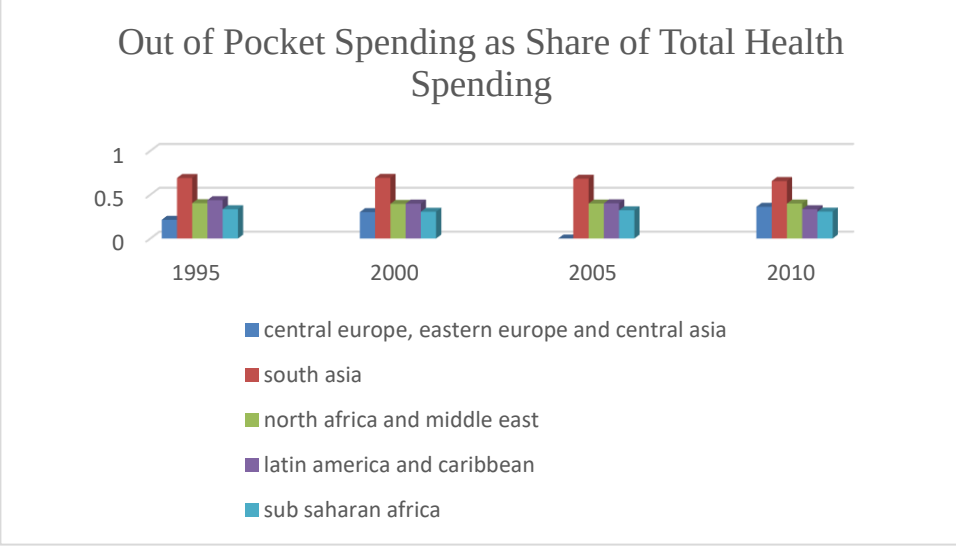
Total health expenditure is the sum of public and private health expenditures as a ratio of total population. It covers the provision of health services family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation. The graph shows that as economic growth done rapidly in 2000s, the total health spending of these regions also increases more rapidly in 2000s. Due to more calories in a day, people caught by obesity and then different kind of diseases. In this way government have to spend more money to overcome these diseases.

Health consumption, add up to (% of Gross domestic product) in Latin America and Caribbean was accounted for at 7.2803 % in 2014, as per the World Bank (2015) accumulation of improvement pointers, aggregated from authoritatively perceived sources. In 'Europe and central Asia' and 'North Africa and Middle East' region health expenditure also increases rapidly in 2000s as the economic growth increases. The stats of Global Burden of Disease (GBD) analyses that as growth increases health

expenditure increases rapidly. According to world health organization, in 2006 globally health expenditure was 8.7% of gross domestic product.

Notwithstanding immediate costs reflected in health care, backhanded expenses related with obesity incorporate diminished work efficiency, high laborers' pay claims, and lower income. Obesity not just costs the individual, additionally the business. The graph of total health spending shows that the expenses on health increases rapidly every year in all these developing regions which put a direct burden on the economy by spending more part of money in health sector.

Figure 5.8 Out of Pocket Spending as Share of Total Health Spending



Source: Institute for Health Metrics and Evaluation (IHME), 1995-2010

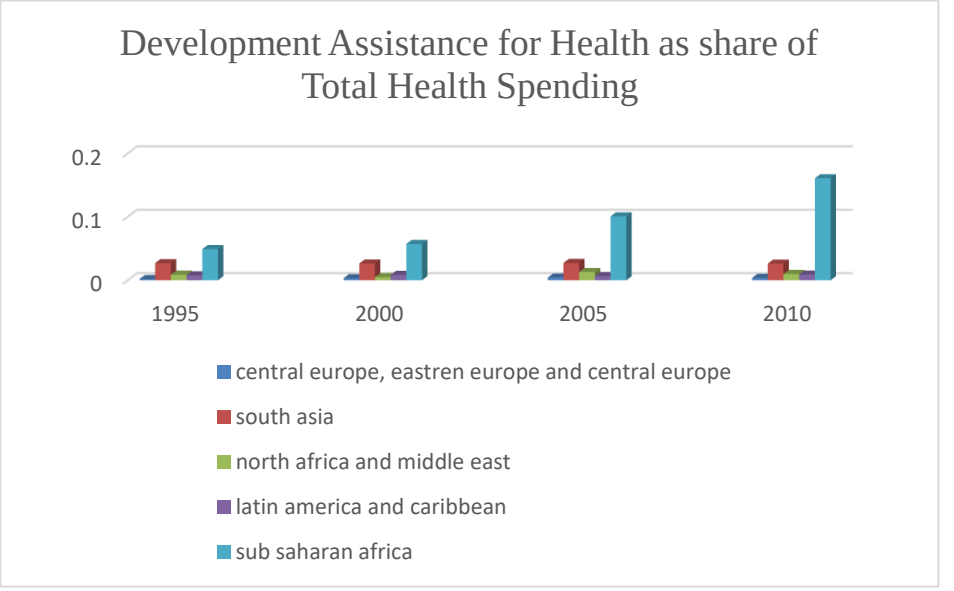
In the medicinal services and protection businesses, out of pocket costs allude to the segment of the doctor's visit expense that the insurance agency does not cover and that the individual must pay all alone. Out of pocket human services costs are not the same as deductibles. Rather, it is an umbrella term that alludes to deductibles, co-pays and coinsurance. Apparently, out of pocket costs constrain the protection holder to precisely consider regardless of whether he really needs restorative care. By making

the individual incompletely in charge of his own charge, it decreases the odds that he is probably going to utilize his protection scope pointlessly.

The graph shows that, South Asia region pay more out of pockets endings. South Asia region have rapid economic growth but has low total health spending due to which out of pocket spending is high because most of countries in south Asia are either low income or middle income countries. Governments give fewer resources to provide free or subsidized health care. So most of people take treatment from their own resource that's why out of pocket spending is high in developing countries.

Latin America and Caribbean has low out of pocket spending than South Asia because their total health spending are high. Government gives more resources for free health care and people use their own resources less. So the regions which have low total health spending will have high out of pocket spending because they give less resources for free or subsidized health care. Out of pocket spending is regressive because lower income people pay disproportionality more than the high income people. When government of a country give less resources for free health care, treatment for diseases will be expensive. This will not be an issue for high income people because they can afford it but low income people spend most of their household expenditures on treatment.

Figure 5.9 Development Assistance for Health as share of Total Health Spending



Source: Institute for Health Metrics and Evaluation (IHME), 1995-2010

The measure of research on donor money related help to health, usually called development assistance for health (DAH), has expanded significantly over the most recent decade. Aid flows for health have doubled since 2000. The graph shows that development assistance for health is more in the Sub Saharan region because this region have low total health spending and out of pocket spending. This is due to because more of countries in this region are poor. Assistance to fight against the major health problems in Sub Saharan Africa has reached extraordinary level. Global attention for health in Sub Saharan Africa has increased dramatically. So due to global assistance deaths from malaria and maternal mortality has dropped by more than half.

While the remaining developing regions have very low development assistance for health. As aid for these regions is very low so they have to spend income from their own resources for health which will increase burden on the economy of a region.

High calories consuming countries have more burden of diseases like hypertension and diabetes. Due high rates of these diseases, government expenditures on health increases and economy fall due to decrease in exports. While in low calories consuming countries, rates of these diseases are low due to low rates of obesity.

So as the economic growth increase, people have more money to spend and have cheap food. So they refer to eat more food with high calories. Excess calories store in the body in the form of fat which is the main cause of obesity. Due to obesity people of a country caught by different diseases like diabetes and hypertension. If people in an economy are ill then they will not take part in the economy with full efficiency and the production of the economy will also decrease due to which exports of a country will fall and their total GDP will also fall. This will put a direct burden on the economy as governments have to spend more money on health sector.

5.4 Comparative Analysis

A nation's economic growth is normally demonstrated by an expansion in that nation's GDP or Gross domestic product. Generally, total national output is an economic model that mirrors the estimation of a nation's yield. A nation's Gross domestic product is the aggregate money related estimation of the goods and services created by that nation over a particular time frame.

Prosperity of a country is measured in terms of its annual gross domestic products which has different relationships with population level of body weight and happiness. Suitable levels of gross domestic product provide a sustainable economic activity, happiness and mean level of body mass index. As GDP will increase of a country the economy of that country will also rise. The people of that country will be more prosperous. Many factors effects the economic growth inversely like obesity. Obesity has a direct relation on the growth of economy.

Obesity is a medical condition in which body fat has increased to the extent that it may have negative effect on health. Obesity is a crucial concern since it is related with poorer mental health results, diminished personal satisfaction, and the main sources of death in around the world, including diabetes, hypertension and a few sorts of cancer. These diseases are

responsible for a lot of deaths in worldwide. So these diseases increased the treatment cost in the world.

In light of the current commonness and pattern information and the epidemiological proof connecting obesity with a scope of physical and psychosocial wellbeing conditions, it is sensible to portray obesity as a general health disaster that seriously weakens the health and personal satisfaction of individuals and adds impressively to national medicinal services spending plans. The expansion in weight worldwide importantly affects health weakness and lessened personal satisfaction. Specifically, obesity has a vital commitment to the worldwide rate of cardiovascular sickness, diabetes and hypertension. Obesity has a more pronounced effect on dismalness than on mortality.

Another cast that economy has to pay is in the form of low productivity. Due to ill health workers will produce less which will impact his income and the firm's profit. So obesity is a burden for the world economy in the form of expenditures on diseases it produces and low production.

6. Conclusion and Policy Recommendations

6.1 Conclusion

The present study tries to explore the impact of obesity on the economic growth in different developing regions of world like South Asia, Sub Saharan Africa, north Africa and middle east, Latin America and Caribbean and central Europe, eastern Europe and central Asia. Economic growth is measured in GDP. At first the trend of GDP of these regions was made through data from the world development indicator. The trend shows the rate of growth in different years. As the GDP growth rate of a region increase, per capita income of that region also increases. As per capita income increase, people have more money to spend on food.

Secondly, the graphs of calories intake by a person per day was made and the trend of the regions are shown separately. As the economic growth increase in a region per capita income of that country increase also. People of that region have more money to buy food. They tend to use animal source

food like fish and meat which are full with high calories. The trend of calories shows that as growth increase in a region, there is an increase in calories intake by a person per day. It can be seen that there is a significant increase in calories intake every year as economic growth increase. People do not use these calories fully. Due to imbalance between calories consumed and calories expended obesity and overweight arise in the people.

By consuming more calories obesity arise in the people due to which major diseases are produces in the people like diabetes, hypertension and breast cancer. The graph of these diseases are made by taking data from GBD global burden of disease. The trend shows that as people consumed more calories in these developing regions, there is an increase in the rate of these diseases. The graphs of diseases shows that region that have rapid growth rate also have high burden of diseases. As these diseases increases, these put a burden on the economy in the form of increased health expenditure for better treatment. Another cost that economy have to pay is in the form of low productivity. Due to ill health workers will produce less which will impact his income and the firm's profit.

It is concluded that as economic growth increases, per capita income also increases. Resources become available to buy more food. As such people consumes more calories and obesity rates increases. Due to obesity major diseases like hypertension, diabetes and breast cancer also increases which put a burden on the economy because economy have to pay cast for the treatment of these daises.

6.2 Policy Recommendations

In the context of this study, following policy recommendations are proposed:

1) Government must encourage the people by teaching them about obesity in institutions.
2) Promoting healthy eating habits and encouraging exercise.
3) Developing public policies that promote access to health and low fat.

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Pro-Cyclicality of Monetary Policy with Graduation, Institutions and Governance: A Case Study of Pakistan

Tariq Hussain*, Muhammad Qasim** & Khizra Rana***

Abstract: Monetary policy role in stability has immense importance especially in the perspective of institutions and governance of a country. This policy performs well in the presence of well-functioning institutions and good governance. Generally, monetary policy adopted by the developed countries is counter cyclical whereas developing economies like Pakistan adopt pro-cyclical policy. Although, developing economies' institutional qualities are key elements in determining their ability to graduate. Ordinary Least Square **(**OLS) and Two Stage Least Square (2SLS) techniques are applied to evaluate that monetary dogma is either counter cyclical in nature or pro-cyclical in Pakistan. It is established that monetary strategy is pro-cyclical. High profile institutions and good governance is indispensable for counter cyclical monetary policy. Pro-cyclical policy is taken on due to low performing institutions with their lower qualities and poor governance. The financial institutions should take the appropriate measures to manage the pro-cyclical approach of monetary policy. This is one of the initial studies that investigate the cyclicality nature of monetary strategy and role of institutions and governance in Pakistani context.

Keywords: Monetary Policy, Cyclicality, Pro-cyclical, Counter Cyclical.
JEL Classification: E50, O43, G30

1. Introduction

Stability is a significant goal of nations in this global world. So as to accomplish this aim, definite passageways and strategies are required. Acemoglu *et al* (2003) explicated that growth strategies have considerable part in attaining the growth stability.

The risks in selecting the right growth policy are high (Lucas, 2003). Macroeconomic policies are concentrating to stabilize business-cycle instabilities. Comprehending economic business cycles and their

*The author is the Head of Department/ Assistant Professor at the University of Lahore, Pakpattan Campus
**The author is a PhD Scholar at National College of Business Administration and Economics, Lahore
***The author is an MPhil Scholar at the University of Lahore, Pakpattan Campus

consequences for optimum monetary strategy remain a principal experiment for research economists. Monetary policy target is to unwavering business-cycle instabilities and oscillations are normally considered such as optimum (Woodford, 2001). Hence, counter-cyclical strategies are so focused with an opinion of minimizing output instability and stabilizing inflation at a satisfactory level. A monetary policy strategy which soothes mutually inflation and output about the agreed targets is counter-cyclical in nature. The present study analyzes the part of monetary strategy in the viewpoint of institutions and governance of Pakistan.

In contradiction of advanced industrialized economies, emerging economies (EEs) and developing economies are regarded as these economies adopted procyclical or, counter cyclical monetary policy. Lane (2003), inveterate that state banks among developing economies incline to escalate interest ratios through recessions as well as vice versa. In the same way, procyclical monetary policy caused to destabilize the economy (Kaminsky et al. 2004). The cyclicality of monetary strategy varies among different country groups. There is abundant indication that advanced economies incline to track counter-cyclical macroeconomic strategies (Melitz (2000), Gali and Perotti (2003), though most evolving and developing economies conduct procyclical monetary policy (Gavin and Perotti (1997), Ilzetski and Vegh (2008).

Besides this institutions have significant role in implementing growth policies. Developing economies are still deficient in the procedure of economic growth as of developed economies and the ratio of per capita earnings is not adequate. Moreover, the solemn problem of their sluggish growth is halted anywhere else. Therefore, hurdles of sluggish economic growth specify only design of growth and growth of per capita GDP (Lucas, 1988). So, dissimilar economies have the diverse shape and foundations of economic growth. This alteration is perceived through institutional design of advanced and less developing economies.

North and Thomas (1973) explained the originality, capital accretion plus edification, are not considered as causes of economic growth; actually these are true economic evolution. Factor congregation and originality are simply

contiguous reasons of actual growth. Therefore, principal explanation of proportional growth is distinction among institutions. Calderon *et al.* (2004 and 2012) focused the significance of robust political and economic institutions for the countries to execute counter-cyclical type macroeconomic growth strategies. As well this institutional potentials and qualities have significant contribution regarding on graduation from monetary pro-cyclicaity. It is observed that as qualities of institutions accelerate the procyclicality of growth policy decreases. There are four phases of graduation; 1.Established Graduate (EG) (Counter cyclical) 2. Still in School (Procyclical) (SS) 3. Back to School (BS) (Procyclical) 4.Recent Graduate (RG) (Counter cyclical) (Frankle et al. 2011).

Institutions assist as contributor to governance. The likelihood of crashes is diminished and assists to achieve the contracts via the legal method. Institutions provide pure and ostensible device to direct businesses, therefore to minimize dishonesty and bureaucracy intended hurdles (Grigorian and Martinez 2000).

There is a pioneering application of governance gauges since the preceding twenty years. These gauges are frequently applied to evaluate the efficiency of advanced and underdeveloped countries. A massive exertion on governance gauges is completed in a number of organizations as World Bank and Development Assistance Committee (DAC). Hence, the governance indicators and measurements of first generation are equipped by the key persons of World Bank and numerous researchers as Rodrik (1997) and Isham *et al* (1997). These indicators pull our devotion to the exact matter of governance in both advanced and under developed countries. Though, the formation of first generation indicators has trouble to regulate with applied issues and could not provide any greater grasp on reform objectives. After that the next or second generation gauges have definite method and attempt to shield the deficiencies of first generation developed indicators. Therefore, Second generation gauges are categorized as translucent, precise and definite (Knack and Manning, 2003). The indicators as Civil liberties and Political Rights are established by Freedom House and used in present study to

measure governance. Scully (1998) and Levine and Renelt (1992) applied such indicators in their practical studies.

The less developed economies espouse pro-cyclical policies owing to meager efficiency of institutions (Tornell and Lane, 1999). So, the developing countries still face hurdles like less GDP, a little saving ratio, squat investment, amassed unemployment, mounting government's disbursements particularly non development expenses, agrarian contextual and pitiable tax assortment. By way of all these features, the fantasy of economic steadiness is becoming further problematic. Together with these dishonest bureaucracy and unproductive administration machinery marks the execution of growth strategies convoluted and tough. One of the vigorous foundations of realization is monetary strategy which is elaborated in case of Pakistan.

Being developing economy, Pakistan's monetary strategy has healthy part to bring stability. However, Pakistan's monetary policy is operationalized by State Bank of Pakistan (SBP). Pakistan adopted monetarism to attain monetary stability. Monetarism is that monetary policy is a leading foundation for controlling the business rotation fluctuation and an unceasing monetary evolution rule can be trailed in order to suave out the uncertainties in output. State Bank of Pakistan (SBP) managed progression in M2 contained by required bounds. Broad money is issued on the source of a projected money demand purpose by keeping in view government's per annum economic growth and inflation goals for the year. (Hanif *et al*. 2016). SBP shifted from monetary targeting to a wide-ranging technique and exchange rate has the major role of market motivated. The operative objective has been converted from backup money to the market place repo ratio. Therefore, monetary strategy position is gestured through variation in discount ratio and legal liquid proportion.

The major objectives of the study are as follows

- To analyze whether Pakistan is Sill in School (SS) phase of Graduation regarding monetary Policy
- To evaluate the role of Economic Institutions and Governance in adopting the Pro-cyclical Monetary Policy

- To assess the role of Political Institutions and Governance in adopting the Pro-cyclical Monetary Policy

The structure of this paper is like. Segment II comprises review of significant literature; Segment III elaborate the theoretical context of the study, methodology of the paper is explained in the next segment IV, empirical conclusions are given in segment V and in segment VI conclusion are elaborated and strategic suggestions and repercussions are also suggested.

2. Review of Literature

Monetary strategies are mostly planned to establish business-cycle oscillations that are ordinarily identified as optimal strategy (Woodford, 2001). Monetary pro- cyclicality strategy is followed by central or state banks to gain integrity (Calvo and Reinhart, 2002 and Mendoza, 2002). It is joint occurrence that state banks in the less developed economies of the world incline to raise interest ratios through slumps and reduce in enlargement. This is too establishing fact regarding pro-cyclicality of monetary policy which is the robust basis to produce the economic instabilities in newly evolving countries (Dolado and Dolores, 2001, Gerrard et al. 2003, and Kaminsky, *et al*, 2004). Though, state banks in advanced OECD economies usually implement monetary policies which are counter-cyclical by nature (Lubik and Schorfheide, 2007). Pro-cyclical monetary policy are repeatedly followed when state banks had deficiency of credibility (Calvo and Reinhart, 2002; Mendoza, 2002). Pro-cyclical type monetary dogma is damaging as it supports the business rotation (Kaminsky *et al*., 2004).

Duncan (2014) examined the links among institutional superiority, cyclicality of monetary policy and instability of output. The developed economies have strong institutions and shows positive output interest rate relation whereas developing economies show negative relation due to weak institutions.

Coulibaly (2012) emphases on Emerging Markets interest amounts and credit evolution through the latest catastrophe. It is discovered that the

indication of adopting the countercyclical type monetary strategy and assigns this to aspects like macroeconomic weaknesses, liabilities, financial segment modification, and implementation of Trade openness besides more counter cyclicality observed in EMs as these factors upgraded. Numerous present studies as Calderon and Schmidt-Hebbel (2008), Calderon *et al.* (2012), Duncan (2014) examined the substantial part of organizations and institutions in implementing counter cyclical, acyclical or procyclical monetary strategy in advanced and unindustrialized countries respectively. However, the role of institutions has given no significant position till 1970s. Institutions' role is vibrant in gaining growth goals. Institutions are foremost source in acquiring growth stability. The existing literature has authenticated role of institutions in the progress of a country. As Mauro (1995) and Roderik *et al* (2004) elaborated the function of a country's institutions is vital for economic growth. Rodrik (2008) exactly stresses the requirement of institutions "Getting the institutions right first" to attain the stability.

The evolution of institutions is elaborated by (North, 1981). The dissimilarity between contract theory and predatory concept is elaborated regarding institutions In line with the first scheme, the administration and associated institutions present the lawful edifice that certificates private treaties to support economic contacts which curtail the transaction costs. Nevertheless, the predatory scheme describes that the government is a method for flowing resources from one group of individuals to another.

In institutional erection amid developing countries, the function of colonial supremacy is too foremost. The colonial powers of Europe have developed gigantic colonial kingdom. The colonial governments established institutions in keeping their own individual benefit. The region, in which the death rates are lofty, the colonial governments' decide not to inhabit in these countries eternally and establish pull out institutions like African country, Congo. These pull out institutions are not interested in providing security of property right and no system is there in disagreement to the government expropriation. Alternatively, the region where weather is supportive, like USA, the colonial governments establish superior

institution resembling the institutions of Europe. Such institutions are functioning in ex- colonial countries (Acemoglu *et. al*, 2001).

Numerous robust empirical studies like Dawson (1998), Heckman and Stroup (2000) and Bangoa and Sanchez (2003) explained that economic institutions have noteworthy connection to enhance the per capita GDP. Du. Plessis (2006) elaborated that South Africa has experienced a segment of noteworthy stabilization since 1990s. The structural (SVAR) procedure is applied to debate the cyclicality of fiscal and monetary policy. The time span of the present study is 1994-2006. It is commonly recognized that monetary strategy has noteworthy part in soothing the economic condition of the country. Though, the part of fiscal strategy is not so robust in this affection. It is established that monetary strategy has steadying role while fiscal strategy is offering procyclical part particularly in contemporary era. Besides institutions, governance is now becoming an indispensable subject matter of research in the present world, particularly in the under developed countries. In 1970s, Word governance is gone off from shadows to brighter shining day in the history of economics. This word, governance is used just five times in the decade of 1970s. In 1980s, it is used 112 times and in the decade of 1990s it is used 3,825 times (Dixit, 2009).

Chaudhry (2009) examined the effect of different noteworthy economic and social variables on indicators of governance. The findings of the study propose that societal and economic (fiscal and monetary) variables have actually sturdy effects on the issue of governance. Sharma (2007) explained the effects of poor governance on economy which holds back the economic growth procedure

Akram *et al* (2011) examined the dominant poverty in Pakistan. It is instigated due to two major reasons one is meager governance and the other is income inequality. The present study attempts to discover the impact of meager governance and rising inequality. The study covers the time period from 1984 to 2008. Time series approach, Autoregressive Distributive Lag (ARDL) is used to observe the association between poor governance and poverty. No doubt there is robust association among these two variables. Hence Governance should be upgraded to diminish the level of poverty.

Coulibaly (2012) and Vegh and Vuletin (2012) found the evidence of graduation among emerging economies (EM). These economies became graduate (adopt counter cyclical monetary policy) as increasing the quality of their institutions.
Frankel *et al.* (2013) elaborated that numerous developing economies are converted from executing pro-cyclical type fiscal strategy to accomplishment of counter-cyclical fiscal strategy in the early period of 2000s. Though, it is claimed that by upgrading the institutional qualities, this conversion is acquired.

Kifayat Ullah *et al*. (2016) elaborated the role in institutional quality regarding monetary policy of Pakistan. The variable of institutional quality is insignificant in the long run ARDL findings.

3. Theoretical Consideration

The classical approach of monetary policy is double the money and doubles the price. According to the classical economists, money has no significant role in economic growth. However, Keynesians do not support this direct link of money with the price level. In present ear, monetary policy is performed by the central bank of a country. It controls the money supply and rate of interest to gain the stability in the economy. Through changing the interest rate, the spending level will be increased or decreased. In order to change the spending level, the money balance also has significant effect. Chari, *et al* (1995) elaborated the role of money in the economy. Money significantly affects the price level.

The theoretical foundation of the counter-cyclical policy method is the new Keynesian open economy model, which proposes that under full unification, the case wherever an economy can borrow and loan easily in the worldwide financial markets, the optimum policy method is counter-cyclical whereas for economies which are autarky, pro-cyclical growth policies are perfect (Yakhin, 2008). There are a numerous pragmatic studies on the nature of monetary policy in developing countries. These include Coulibaly (2012) and Du-Plessis et al. (2007), Takáts (2012), Yakhin

(2008), Kaminsky et al. (2004), Calderon et al. (2003) as well as Lane (2003) elaborated pro-cyclicality of monetary dogma.

Cyclicality (pro-cyclicality, counter-cyclical or acyclial) regarding growth policies (Fiscal and Monetary) is because of weak national financial arrangement, increasing debt quantity, and low reliability in economic growth strategies (Talvi and Vegh, 2005). Slimane *et al* (2010) examined that less developed countries implement pro-cyclical economic growth policies because of weak institutions. The economies committing pitiable growth strategies possesses fragile institutions, inescapable corruption rate, be lacking in the execution of property rights, repudiation of bonds, occurrence of weak political structure of institutions (Acemoglu, *et al*, 2003).

The usage of term institution is at present common in the area of social sciences in current years. It reveals that the evolution in institutional economics and the usage of the institution perception in numerous other areas, as well as philosophy, social work, political science, and geography. This notation has an extensive antiquity of practice in the social sciences, seeing back as a minimum to Giambattista Vico in his famous Scienza Nuova of 1725 (Hodgson, 2007).

Likewise, the neo classical economists had not focused to the part of institutions in the growth procedure. The classical and neo classical economists only stress to production activities and technical enhancement. They do not concentrate fully to legal property civil rights and defense issues (Rodrik, 2000). Institutions have sturdy role in economic growth and intensified by numerous researchers. Wolf (1955) elaborated that economic institutions stimulate or hinder procedure of progression. Besides this governance has also significant role in growth accelerating activities. Poor governance hinders the smooth functioning of monetary policy. The thought of governance is not new. There is a revolutionary usage of governance signs since previous twenty years. Such governance gauges are applied to evaluate the efficiency of both less developed and developed countries. A massive toil on governance is completed in various

organizations as World Bank and Freedom House. However, the indicators regarding governance could not gain significant importance till 1990s and then special attention is given through the World Bank. The World Bank's head explained that Bank necessarily analyze the procedure of loan. This loan would be connected with political efficiency like lower the level of corruption (Arndt and Oman, 2006).

4. Data Sources and Methodology

4.1 Sources of Data

The data in present study is time series and the time duration is 1980-2016. The data is composed from World Development Indicators and hand book of Statistics published by State Bank of Pakistan.

4.2 Methodology

The robust aim of this study is to perceive the nature of cyclicality of monetary strategy by keeping in view both the institutions (Economic and Political) and governance. The part of institutions is particularly concentrated; robust institutions support the government in executing monetary growth policy. Though, institutions and variables regarding growth may be the basis the endogeniety (Falcetti, et al. 2002). Correspondingly, the dataset about institutions may be source of multicollineraity. Therefore, Principal Component Analysis (PCA) approach is used.

4.2.1 Principal Component Investigation

The foremost objective of this approach is to declining dimensionality in the data. Preisendorfer and Mobley (1988) elaborated Beltrami (1873) firstly recognized the singular value decomposition (SVD) in this way that planned contemporary PCA. Nevertheless, this is commonly anticipated that the preliminary explanations of current PCA is presented by Pearson (1901) and Hotelling (1933). This approach is linear amalgamation or alignment of the arbitrary variables X1, X2…..Xn and be reliant on the covariance milieu.

4.2.2 Order of Identification

For order condition the following formula is used.

$$K - k \geq m - 1$$

m = Number of endogenous variables in the equation to be identified.
K = Number of predetermined variables in the model.
k = Number of predetermined variables in the equation to be identified.

$$K - k \geq m - 1 \qquad K = 14,\ k = 11 \text{ and } m = 1$$

So order condition is fulfilled.

4.3 Two Stage Least Square (2SLS)

Two SLS procedure was advanced by Theil (1953a and b) independently. Basman (1957) and Sargan (1958) added a lot to the 2SLS. The dependent variable of one equation may appear as independent variable in other equation. The variables used in this method are not independent of each other. The use of OLS will produce inconsistent result. 2SLS can be applied to individual equations. This methodology is easy to apply as there is only need to identify the sum of exogenous variables. The plain hint behind the 2SLS method was to substitute the random endogenous regressor with one which is non-random and subsequently autonomous of the error term (Asteriou, 2006). 2SLS estimation was carried out by single equation method. The estimation of single equation was unaffected by the other equation of the system in 2SLS (Creel, 2006).

Suppose the estimate vector η (eta) in the regression model. Estimate of η required variables which are instruments. A variable correlated with endogenous variable in z_t and uncorrelated with error μ_t is called a valid instrument.

$$y_t = \eta' z_t + \mu_t \ldots\ldots\ldots(1)$$

$$y_t = \eta_1 + \eta_2 z_{2t} + \eta_3 z_{3t} + \eta_4 z_{4t} + \eta_5 z_{5t} + \mu_t$$

Consider regression of z_{it}

$$z_{it} = \delta_t' x_t + e_{it} \text{.....(2)}$$

Fitted value for regression given by

$$\hat{z}_{it} = \hat{\delta}_t' x_t \text{.....(3)}$$

Suppose where

$$\delta_t = \left[\sum_{t=1}^{T} x_t x_t'\right]^{-1} \left[\sum_{t=1}^{T} x_t z_{it}\right] \text{.....(4)}$$

$$\hat{z}_{it} = z_{it}$$

$$\hat{z}_t = \delta' x_t \text{.....(5)}$$

Transpose

$$\hat{\delta}^t = \begin{bmatrix} \hat{\delta}_1' \\ \hat{\delta}_2' \\ . \\ . \\ \hat{\delta}_k' \end{bmatrix} = \left[\sum_{t=1}^{T} z_t x_t'\right]\left[\sum_{t=1}^{T} x_t x_t'\right]^{-1} \text{.....(6)}$$

So

$$\eta_{2sls} = \left[\sum_{t=1}^{T} \hat{z}_t' \hat{z}_t'\right]\left[\sum_{t=1}^{T} \hat{z}_t y_t\right] \text{.....(7)}$$

Putting the value $\delta' x_t$ from equation no 5

$$z_{it} = \hat{\delta}_i' x_t + e_{it} = \hat{z}_{it} + \hat{e}_{it} \text{.....(8)}$$

By the condition of orthogonal

$$\sum_{t=1}^{T} x_t \hat{e}_{it} = 0$$

Put the values $\hat{z}$ from equation no 5

$$\sum_{t=1}^{t} \hat{z}_{jt} \hat{e}_{it} = \hat{\delta}_j' \sum_{t=1}^{T} x_t \hat{e}_{it} = 0$$

Multiply equation 8 by $\hat{z}_{jt}$

$$\sum_{t=1}^{t} \hat{z}_{jt} z_{it} = \sum_{t=1}^{t} \hat{z}_{jt} (\hat{z}_{it} + e_{it})$$

By the definition of Kronecker delta z_{ji} = (1 if i=j, o if i ≠ j)

$$\sum_{t=1}^{t} \hat{z}_{jt} z_{it} = \sum_{t=1}^{T} \hat{z}_{jt} \hat{z}_{it}$$

$$\sum_{t=1}^{t} \hat{z}_t z_t = \sum_{t=1}^{T} \hat{z}_t \hat{z}_t$$

$$\eta_{2sls} = \left[\sum_{t=1}^{T} \hat{z}_t \hat{z}_t' \right] \left[\sum_{t=1}^{T} \hat{z}_t y_t \right]$$

Put the value of $\hat{\delta}'$ from equation 6

$$\eta_{2SLS} = \left[\left[\sum_{t=1}^{T} z_t x_t' \right] \left[\sum_{t=1}^{T} x_t x_t' \right]^{-1} \left[\sum_{t=1}^{T} x_t z_t' \right]^{-1} \right] \left[\left[\sum_{t=1}^{T} z_t x_t' \right] \left[\sum_{t=1}^{T} x_t x_t \right]^{-1} \left[\sum_{t=1}^{T} x_t y_t \right] \right]$$

Consider the special case in this number of instruments is exactly equal to number of endogenous explanatory variable

$$\eta_{IV} = \left[\left[\sum_{t=1}^{T} x_t z_t'\right]^{-1}\left[\sum_{t=1}^{T} x_t x_t'\right]\left[\sum_{t=1}^{T} z_t x_t'\right]^{-1}\right]\left[\left[\sum_{t=1}^{T} z_t x_t'\right]\left[\sum_{t=1}^{T} x_t x_t'\right]^{-1}\left[\sum_{t=1}^{T} x_t y_t\right]\right]$$

Above equation is also known as instrumental variable (IV) (Hayashi, 2000).

4.4 Test For Endogeniety

This endogeniety test is established by Durbin (1954), Wu (1973) and Hausman (1978). These tests, evaluate the given model via using mutually Ordinary Least Square and IV approaches. The assessment can basically be executed by amassing the residuals of all endogenous right-hand side variables, such as meaning of the complete exogenous variables.

5. Empirical Findings

5.1 Going on Graduate from Monetary Pro-cyclicality

Going on graduate from monetary pro-cyclicality is evaluated through institutional qualities. There are four variables of institutional qualities; Investment Profile, Corruption, Law and Order and Bureaucratic Quality are applied to evaluate the cyclicality. An index is constructed through applying equal weight. The institutional qualities index is ranges from 0 to 1. The average value of the Index is 0.39. Lower values of Index shows the pro-cyclicality of monetary policy. It is found that Pakistan “Still in School (SS)” phase of graduation. The findings are in accordance with Frankel et al (2013).

5.2 Selection of Pragmatic Model

So as to evaluate cyclicality of monetary policy, monetary response is assessed through the domestic credit to private sector, output gap and a few control variables. In order to find the output gap, Hodrick-Prescott (HP) filter is applied, as Kaminsky *et al* (2004). Therefore, to suave time series annual data, the parameter is adjusted at 6.25 as recommended by Ravn and Uhlig (2002). By way of cyclicality is a foremost hint which assists to understand the pathway of monetary strategy. In this study, the following model is used to estimate cyclicality.

$$LogDCP_t = \alpha_0 + \alpha_1 LogY_t + \alpha_2 LogX_t + \varepsilon_t \qquad \text{(Eq 1)}$$

DCP is domestic credit to private sector, *Y* is the output gap estimated as the cyclical element of quantity produced divided by real production, *X* is the control variables, ε_{it} disturbance term, α_0 is intercept and all α s are coefficients and *t* is for time.

$$X_t = DCP_t, GDPH_t, LDCP_t, POL_t, FDIP_t, EXP_t, GOVI_t, GCEG_t,$$
$$INF_t, IMP_t, POPT_t, ECO_t, UNEM_t, GFCG_t$$

DCP = Domestic Credit to Private Sector

GDPH = GDP hodrick-prescott

LDCP = Lag of DCP

POL = Political Institutions

FDIP = Foreign Direct Investment

EXP = Export

GOVI = Governance Index

GCEG = Government Consumption Expenditure Growth

INF = Inflation

IMP = Import

POPT = Population Total

ECO = Economic Institutions

UNEM = Unemployment

GFCG = Gross Fixed Capital Growth

With the aim of to estimate the monetary strategy, either it counter cyclical or pro cyclical, DCP is used as dependent variable as kaminsky et al, (2004) elaborated that it has a cyclical constituent. This study applies OLS and Two Stage Least Square (2SLS) approaches to evaluate the cyclicality of monetary policy. The following models are used in this study.

5.2.1 Models of the Study

The following are the models of the study.

5.2.1.1 Model 1: Monetary Policy Cyclicality, Economic Institutions and Governance

$$\log DCP_t = \alpha_0 + \alpha_1 LogGDPH_t + \alpha_2 LogLDCP_t + \alpha_3 LogECO_{it} + \alpha_4 LogUNEM_t + \alpha_5 LogGCEG_t + \alpha_6 LogEXP_t + \alpha_7 LogGFCG_t + \alpha_8 LogGOVI_t (LogPOPT_t = LogIMP_t, LogINF_t) \quad \text{(Eq 2)}$$

5.2.1.2 Model 2: Monetary Policy Cyclicality, Political Institutions and Governance

$$LogDCP_t = \beta_0 + \beta_1 LogGDPH_t + \beta_2 LogLDCP_t + \beta_3 LogPOL_t + \beta_4 LogFDIP_t + \beta_5 LogEXP_t \beta_6 LogGOVI_t + \beta_7 LogGCEG_t + (LogINF_t = LogIMP_t, LogPOPT_t) \quad \text{(Eq 3)}$$

5.3 Empirical Results

Cyclicality of monetary policy, institutions and governance relationship is analyzed. In this regard descriptive statistics are elaborated first.

5.3.1 Descriptive Statistics

The foremost structures of numerical description of the given variables are presented in the following table.

Table 5.1 Descriptive Statistics

	LDCP	LDCPP	LECO	LEXPP	LGCEG	LGDPH	LUNEM	LGFCG	LGOVI	LPOPT	LPOL	LINF
Mean	3.06	3.07	2.44	2.69	2.04	25.51	1.52	1.41	1.73	18.72	2.04	2.2
Median	3.19	3.17	2.43	2.71	2.11	25.35	1.53	1.46	1.74	18.64	2.08	2.18
Maximum	3.21	3.27	2.49	2.82	3.02	26.05	1.83	1.99	1.85	19.04	2.08	2.51
Minimum	2.76	2.8	2.4	2.5	0.41	25.06	1.14	0.92	1.45	18.46	1.95	1.97
Std. Dev.	0.21	0.2	0.04	0.13	0.95	0.42	0.24	0.41	0.15	0.24	0.068	0.21
Skewness	-0.71	-0.59	0.43	-0.24	-0.72	0.49	-0.34	0.03	-1.18	0.48	-0.71	0.3
Kurtosis	1.52	1.54	1.58	1.39	2.49	1.55	2.15	1.82	3.25	1.56	1.5	1.62
Jarque-Bera	1.05	0.88	0.68	0.69	0.58	0.76	0.29	0.35	1.42	0.75	1.06	0.56
Prob	0.59	0.64	0.71	0.71	0.74	0.68	0.86	0.84	0.49	0.68	0.58	0.75

ability												
Sum	18.34	18.43	14.69	16.15	12.22	153.06	9.12	8.45	10.36	112.37	12.21	13.22
Sum Sq. Dev.	0.23	0.2	0.007	0.09	4.52	0.86	0.29	0.86	0.11	0.29	0.023	0.22
Observations	6	6	6	6	6	6	6	6	6	6	6	6

The variables used in this study are twelve and the time period is 1980-2016. . The mean and median values of above mentioned variables are very adjoining and this show symmetry among variables. These variables are closely spread from the mean values as specified by the minor standard deviations. LPOL is less volatile variable. The variables used in this study are not greatly skewed as their skeweness values are near to zero. The values of kurtosis are not remote from three. Jarque- Bera values display the standard distribution of all variables used in the study.

Model 1: Cyclicality of Monetary Policy, Economic Institutions and Governance

So as to evaluate the cyclicality of monetary strategy, OLS and 2SLS techniques are used in present study. The variables Economic institutions and governance are too used to evaluate their role in monetary strategy. The outcomes are prearranged in the following Table.

Table 1: Monetary Policy, Eco Institutions and Governance (Dependent Variable: LogDCP)

Variables	**OLS**		**2SLS**	
	Coef.	P	Coef	P
loggdph	6.2407	0.072***	10.0366	0.068***

logLdcp	0.4962	0.027**	0.4889	0.043**
logeco	-3.7649	0.107	-4.8659	0.088***
logunem	0.0308	0.868	0.1221	0.588
loggceg	-0.0201	0.369	-0.0244	0.337
logexpp	0.5985	0.045**	0.6769	0.048**
loggfcg	0.0827	0.094***	0.086	0.114
loggovi	0.3068	0.128	0.3751	0.113
logpopt	-10.857	0.072***		
cons	52.6624	0.055	82.0622	0.058

The OLS and 2SLS results elaborate that the monetary strategy in Pakistan is procyclical as LogLDCP is noteworthy in our two models and possesses affirmative coefficient sign. Besides this, the Loggdph is also significant that also elaborated the cyclical behaviour of monetary strategy. Both the variables are robust in determining the cyclicality of monetary policy. The positive coefficient signs elaborate that the monetary policy is pro-cyclical. The economic institution variable Logeco is significant and has negative coefficient sign. These findings are similar as of Kaminsky et al, (2004) and Calderon *et al* (2012). This elaborates that Pakistan adopts pro-cyclical monetary policy. It is owing to meager performance of institutions (Duncan, 2012). Logeco is significant and possesses negative coefficient sign that show the weak efficiency of our institutions. Hence, governance variable Loggovi is insignificant. The variables logUnem, Loggfcg and Loggceg are insignificant in both models. The diagnostic tests; Auto, Hetro and Ramsey P. Values are 0.3418, 0.4894 and 0.5380 respectively. Endogeniety test is also performed and the P. value is 0.0000 which show that endogeniety exist in the model.

Model 2: Cyclicality of Monetary Policy, Political Institutions and Governance

So that, estimate the cyclicality of monetary strategy, OLS and 2SLS tests are used in this model. The variables of Political institutions and

governance are applied to evaluate their part in monetary strategy. So, the findings are provided in the following Table.

Table 2: Monetary Policy, Eco Institutions and Governance (Dependent Variable: LogDCP)

Variables	**OLS**		**2SLS**	
	Coef.	P	Coef	P
loggdph	0.4007	0.019**	0.3994	0.021**
logLdcp	0.2512	0.097***	0.2526	0.098***
logpol	-0.3531	0.058***	-0.3498	0.061***
logfdip	0.0631	0.035**	0.0625	0.037**
logexpp	0.277	0.007*	0.2772	0.007*
loggovi	0.1272	0.017*	0.1277	0.016**
loggceg	0.0073	0.028**	0.0074	0.029**
loginf	-0.0512	0.026**		
cons	12.37	0.023	12.33	0.024

The OLS and 2SLS results indicate regarding the monetary strategy in Pakistan is pro-cyclical. The LogLDCP variable is significant in OLS and 2SLS and the sign of the coefficient is positive. The variable Loggdph is noteworthy that elaborates the cyclical behaviour of monetary strategy. As both the variables are significant and have positive coefficient sign which depict that monetary policy is pro-cyclical in Pakistan. The political institution variable is significant and negative coefficient sign. The results of two key variables are identical as of Calderon *et al* (2012). This elaborates that Pakistan adopts pro-cyclical type monetary strategy. This is caused by pitiable performance of institutions (Duncan, 2012). Logpol is significant and negative coefficient sign which elaborates the meager performance of political institutions. All other variables logfdip, logexp, loggovi and loggceg are significant. The diagnostic tests; Auto, Hetro and Ramsey P. Values are 0.7099, 0.7198 and 0.5082 respectively. Endogeniety test is also performed and the P. value is 0.0000 which show that endogeniety exist in the model.

6. Conclusion and Policy Recommendations

The present study has elaborated the cyclical association amid monetary strategy, institutions and governance in Pakistan. Besides this, pro-cyclicality of monetary dogma with graduation is also elaborated. Institutional quality matters a lot regarding adopting cyclicality of monetary dogma. The countries having high quality institutions adopt counter cyclical monetary dogma. As there are four phases of graduation but Pakistan is still in the phase of "Still in School" (SS). It clearly depicts that Pakistan is still adopting Pro-cyclical monetary strategy. The time series data for the period of 1980-2016 is applied for pro-cyclicality of monetary policy in Pakistan. So as to appraise the cyclical aspect of monetary strategy in Pakistan, the part of institutions with governance is also examined. In order to evaluate the monetary policy cyclicality, Ordinary Least Square (OLS) besides Two Stage Least Square (2SLS) techniques are used. The OLS and 2SLS outcomes show that the monetary strategy in Pakistan is procyclical. LogLDCP and LogGDPH are significant and robust in OLS and 2SLS models and have affirmative coefficient sign. This elaborates that monetary policy is procyclical in Pakistan. The role of institutions is vigorous in cyclicality of monetary dogma. The variables regarding economic and political institutions are significant and possess negative coefficient sign suggest the weak quality of institutions. So due to weak institutions, Pakistan adopt pro-cyclical monetary policy. Governance variable is insignificant in model 1 and significant in model 2. The variables logfdip, logexpp and loggceg are significant in model. The results are as in study of Calderon *et al* (2012). This clearly shows that monetary policy in Pakistan is pro-cyclical.

There is dire need to improve the performance of Economic and political institutions. Pakistan should strengthen economic and political institutions with good governance to apply counter cyclical monetary policy. Besides this, FDI and Exports should be focused by the government as both increase the level of domestic credit to private sector. As FDI increases, the local investors will be motivated, further more increase infrastructure facilities

due to FDI also allures the investors and banker to take active part in economic activities. Accelerating exports also play robust role in increasing DCP.

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