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EFFECT OF AN OPEN SOLID WASTE DISPOSAL SITE ON THE VALUE OF RESIDENTIAL PROPERTY (EVIDENCE FROM RASHEED GARHI PESHAWAR)

Received: 22 May 2019 / Accepted: 23 October 2019 / Published online: 16 March 2020

Abstract

This study analyses the economic effect of the disposal of solid waste at an open dumpsite at Rasheed Garhi Peshawar. Peshawar is the capital of the province of Khyber Pakhtunkhwa. A sample of 135 respondents is selected from the target area using the multi-stage sampling technique. OLS regression is used to analyse the impact. The results of the study reveal that as the distance from the dump site increases, the value of residential properties increases, and the existence of a constant odour in the target area reduces the value of houses by approximately 12 percent. On the basis of the results, the study recommends that proper solid waste disposal methods be adopted by the government and that open dump sites should not be near residential areas.

JEL CLASSIFICATION: Q24; Q50; Q51; Q53; Q58.

KEYWORDS: SOLID WASTE DISPOSAL; RESIDENTIAL PROPERTY; SALES VALUE; LANDFILL; HEDONIC VALUE.

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1. Introduction

Municipal solid waste is said to be a by-product of human activity that adversely affects the environment. In many parts of the world, particularly less developed countries, the open dumping of solid waste disposal method is still used. Most developing countries use inefficient and outdated methods for waste collection and disposal. Even in urban cities, open solid waste disposal sites are found in the suburbs as well as within residential areas. The amount of solid waste has increased with a rise in demand for food and other essentials due to population growth. This increasing amount of waste is ultimately dumped into municipal open disposal sites. These open and improper dumpsites become sources of environmental, health and financial risks to the people living in the vicinity of such dumps (Sankosh, Yan, & Tran, 2013).

A house can be defined as a combination of a physical housing structure, which includes bedrooms and washrooms, with the availability of local and utility facilities and quality environmental amenities in the locality (Kiel, 2006). The presence of housing and neighbourhood facilities along with the presence or absence of quality amenities contributes to differences in property values in a specific locality. The location of a house is said to be a major factor that determines the value of that property. The existence of an environmental amenity is an additional value incorporated into the sales price of the property. As environmental goods are not directly marketed, one of the ways to assign value to them is to examine how the presence or absence of a specific environmental amenity affects the market for residential property and prices of residential property (Irfan & Pant, 2007). The absence of an environmental amenity can be a major factor for housing values. Environmental economists attempt to determine and define the costs to society of ignoring environmental problems. In this regard, the existence of open waste disposal sites in residential areas is becoming one of the key environmental problems that affect society. Different studies have been conducted to analyse the impact of open solid waste disposal sites and landfills as an environmental problem (Butu, Ageda, & Bichi, 2013).

Thus, the present study aims to estimate the effect of open solid waste disposal on the value of residential property in Rasheed Garhi Peshawar, identifying the distance to waste disposal and smell intensity as disseminates.

2. Research Context – Rasheed Garhi Peshawar

Peshawar is one of the largest cities of Pakistan and the capital of Khyber Pakhtunkhwa province, with an estimated population of approximately 4 million. It is estimated that 2.8 percent of major cities in Pakistan will double their populations in the next ten years (Environmental Protection Agency [EPA], 2005). With such a high population growth rate and migration from rural areas, solid waste management systems, similar to the other necessary facilities such as basic infrastructure, water, electricity, and proper sewerage, are not expanding at a sufficient rate, which is creating several health-related risks. According to a study in Peshawar, approximately 809 ton/day of waste is generated (EPA, 2005).

The District of Peshawar comprises urban as well as rural areas. The district government of Peshawar is divided into four towns (Towns I, II, III, and IV) and the Cantonment. The Municipal Corporation (MC) and PDA are responsible for managing the solid waste of urban areas and the cantonment Development Authority (CDA) for the Cantt area, and there is no local authority assigned to managing the solid waste problem for rural areas (Khan, 2006; Pak-EPA/OECC, 2007) in (Rafique et al, 2015).

Peshawar Municipal Corporation is still utilizing the old waste management techniques of open dumping and burning. In Peshawar city, two main methods are used for waste collection: door-to-door collection by different hired waste collectors and garbage containers placed in different areas of the city. The collected waste is dumped at different locations.

One of the dump sites is at Rasheed Garhi, located near the ring road approximately 5.1 km away from the centre of the city. The problem addressed by the current study is this improper waste disposal site and its impact on the value of the residential property in its surrounding areas. The dumping of the waste in an open site near a residential area creates dirt and odour, which affects the area over a larger distance and ultimately creates the adverse effect on residential investment.

Waste disposal is one of the rising environmental problems faced by low-income countries. Around the world, it is generally accepted that the location of a property either positively or negatively influences the price or rent of the property. A property in a clean locality has a value equal to full market value, and a dirty (contaminated) property that poses health or financial risks will see its value significantly affected in several ways (Mundy & Jaffe, 1995).

Port Harcourt (Wokekoro & Uruesheyi, 2014) analysed the effect of open waste dumps on the rental value of residential properties and found that such dumps had significant inverse effects on residential real estate investment by decreasing the rental value of the properties.

Municipal solid waste can be generated from different sources of human settlement activities, commercial activities, hospitals, and clinics (Ali, Pervaiz, Afzal, Hamid, & Yasmin, 2014).

Butu et al. (2013) revealed in their study that the disposal of municipal solid waste along roadsides contaminates the environment. The roadside disposal of municipal solid waste has severe effects for the environment in terms of being a physical nuisance; solid waste dumps also become hiding places for rodents and snakes, which are hazardous.

In another study, Akinjare, Ayedun, Oluwatobi, and Iroham (2011) found that the value of residential property increases at an average of 6 percent with each increasing unit of distance from dumpsites. The study concluded that there is a negative correlation between improper open waste sites and the value of residential property. The study recommended that if the government protects environmental quality, it can positively affect residential property value. Along with the adverse environmental effects of a landfill, the value of residential property is also affected if a dumpsite is in close proximity to the house. A study conducted in Massachusetts used multiple regression analysis to show the effect of six landfill sites on nearby property values, and the results indicated that houses in close proximity faced a loss of 6 percent on average in value of the property (Bouvier, Halstead, Conwary, & Manalo, 2000).

3. Methodology

The current study is based on a survey through a structured questionnaire of households within 600 metres to the dumpsite. A total of 135 households were selected on the basis of multi-stage sampling out of a total of approximately 2700 households (Rafiq, Khan, & Gillani, 2015). In the first stage, the purposive sampling technique was used, and the neighbourhood council 50 Rasheed Garhi in UC Kakshal I was selected. The second stage involved random selection of samples within 600 metres of the dumpsite.

3.1 Theoretical Framework

The theoretical model used in the current study is the hedonic property price approach of Lancaster (1966) and Muth (1966), which is deployed for the purpose of estimating the value of environmental amenities and disseminates based on housing prices. The basic hedonic price function of a composite good X's consumption can be written as

$$H_i = H\ (S, Q, N)$$

where H_i denotes the value of the house, i.e., the resale value as a function of S, which is a vector of structural characteristics (i.e., size, no. of rooms); Q, a vector of location-specific environmental amenities; and N, a vector of neighbourhood characteristics.

The utility function can be written as

$$U = u(X, Q, S, N)$$

The budget constraint is

$$M - H_i - X = 0$$

The 1st order condition for environmental amenity q is

$$(\partial u/\partial q)/(\partial u/\partial x) = \partial H_i/\partial q$$

The partial derivative of the house value function with respect to the environmental amenity gives the marginal price of the environmental amenity.

3.1.1 Empirical Model

The study estimates the impact of open solid waste disposal sites on the sale value of the house; for this purpose, the OLS technique is used.

$$Hv = f\ (hs, pr, dfw, odr)$$

$$hs = \alpha_0 + \alpha_{1\ hs} + \alpha_2 pr + \alpha_3 dfw + \alpha_4 odr + \mu \qquad \text{eq. 1}$$

The explanation of the dependent and independent variables is as follows:

House value (hv) represents the sale value of the house within 600 metres of the dumpsite. The value of the house is adjusted after cross checking with local property dealers.

House size (hs) shows the size of the house in marla.

Portions (pr) shows the number of portions in the house.

Distance from waste (dfw) represents the distance of the house from the dumpsite in metres.

Odour (odr) is entered as a dummy variable for smell intensity in the area: 1= always, 0 = occasional.

μ is the error term.

The following model is estimated:

3.1.1.1 Model

The model is used to explain the value of the house due to changes in the variables related to the structure of the house and the environmental disseminate variables of smell intensity and distance from waste. The variables for the number of rooms and washrooms are omitted from the model due to the problem of multicollinearity.

4. Results & Discussion

The descriptive analysis, correlation matrix and regression analysis are discussed in this section. Descriptive statistics are shown in Table 1, the correlation matrix is shown in Table 2, and the regression analysis is shown in Table 3.

4.1 Descriptive Analysis

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Per-marla value	135	400000	650000	541322.74	89819.86
house size	135	3	7	4.90	1.41
Portions	135	1	2	1.84	.37
distance from waste	135	100	600	383.70	180.88
Valid N (listwise)	135				

Table 1 shows the descriptive statistics. The average per-marla value of the house is estimated to be approximately 5.4 lac, while the average size of the house in the study area was found to be 4.9 marla. The average distance of the house from the waste site was found to be approximately 384 metres. In the study area, the average number of portion was found to be 1.84.

Table 2. Odour Dummy Variable Descriptives

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	**Occasional=0**	79	58.5	58.5	58.5
	Always=1	56	41.5	41.5	100.0
	Total	135	100.0	100.0	

Odour is a dummy variable taking the value of 1 if there is odour always and zero if occasionally there is odour. Approximately 42 percent of households are always affected by the odour, and 59 percent are occasionally affected.

4.1.1 Correlation Matrix

Table 3. Correlation

Per-marla price	House size	Distance from waste	Portions	
1.0000	0.4820	0.3941	0.5897	**Per-marla price**
	1.0000	0.2332	0.5955	**House size**
		1.0000	0.4721	**Distance from waste**
			1.0000	**Portions**

Corr (house value, odour) = -0.53812612

Table 3 shows the correlation matrix, which explains the theoretical relationship between the variables; all the independent variables are positively related to the dependent variable, i.e., the per-marla price of the house. There is a positive correlation of 0.48 between house size and per-marla price, of 0.39 between the distance from the waste site and per-marla price and of 0.58 between the number of portions and the per-marla price of

the house. The existence of odour is negatively correlated (-0.53) with the per-marla price of the house.

4.1.1.1 Regression Analysis

The log model is used to estimate the impact on the per-marla price of the house. The log is applied on the per-marla price of the house and the independent variable of distance from the waste site. Before the regression model is applied, the data and model are tested for all the diagnostics of OLS. The VIF test shows that there is no collinearity among the explanatory variables, as the VIF value for all explanatory variables is less than 10.

Table 4. Variance Inflation Factor

Values > 10.0 may indicate a collinearity problem	
Hs	1.56
Odr	4.36
l_dfw	3.96
Portions	2.04

To remove the problem of heteroscedasticity, the heteroscedasticity corrected model was used.

Table 5. Heteroscedasticity Corrected Model

	Coefficient	**Stand. error**	**t ratio**	**p-value**
Constant	12.18	0.070	173.1	0.000
Hs	0.029	0.0046	6.28	0.00
Portions	0.067	0.013	4.86	0.00
Odr	-0.12	0.012	-9.72	0.00
Dfw	0.14	0.010	12.99	0.00
Sum of squared resid	149.60	**S.E. of regression**		1.07
R- squared	0.92	**Adjusted R-squared**		0.92
F(4,130)	392.42	**P-value (F)**		0.000

The estimated coefficients of the models in Table 5 show that all the independent variables are significantly related to the dependent variable. The

estimation shows that the value of the house significantly increases by 0.02 percent with a one-marla increase in the size of the house. A one-unit change in portions increases the average per-marla value of the house by 0.067 percent. The average per-marla value of the house decreases by 12.06 percent due to the existence of constant odour in the study area. The estimated value of the distance from the waste shows that as there is an increase of one percent in distance from the waste, the average per-marla value of the house also increases by 0.14 percent. The constant is also significant at one percent, which shows that the average per-marla value of the house changes by 12.18 percent.

The R-squared value shows that the independent variables explain 92 percent of the variation in the dependent variable. The F-test value is also significant at 1 percent, showing that the model is highly significant.

5. Conclusion

The regression model in this paper showed that the existence of a dumpsite close to a residential area negatively reduces the value of residential property and is a source of economic loss. Thus, the government should adopt proper waste disposal methods, and open dumpsites should not be in the vicinity of residential areas to reduce economic losses in terms of reduction in property values. Thus, on the basis of the results, the study suggests that local municipal authorities develop proper solid waste disposal sites away from the city areas and manage landfill sites properly to reduce economic losses in terms of decreases in residential property values.

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FACTORS AFFECTING DEMAND FOR REAL MONEY AND INTERNATIONAL CAPITAL MOVEMENT IN PAKISTAN: AN ANALYSIS

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Abstract

The concept of monetary policy is based on the money demand function; therefore, to shed light on Pakistan's monetary policy, this study investigates the factors that influence demand for real money in the country. The data for this research have been taken from world indicators for the period of 1960-2016. The present research examines the influence of real returns and down grading of domestic money in Pakistan. Nevertheless, the demand for real money is highly influenced by the international interest rate. The rejection or acceptance of the log form is based on the non-linearity test. This test shows acceptance of the simple log form at the 1% level. Moreover, the normality and stability of the model in Pakistan are verified by the ARCH, LM, cumulative sum (CUSUM and CUSUMSQ) tests. Furthermore, the ARDL approach is used to find associations between the dependent variables and regressors. The findings show that there is a long-run relationship between money demand and the regressors.

JEL CLASSIFICATION: B4; C41; E10.

KEYWORDS: MONEY DEMAND; RESERVE; INFLATION; EXCHANGE RATE, INTERNATIONAL DEPOSIT INTEREST RATE OF CANADA; PAKISTAN.

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1. Introduction

Past theoretical literature shows considerable disagreement over the function of money in the economy of any country, but two views have now emerged on this topic. The most important pillar of monetary economics is the actual demand for money. This paper empirically investigates the effects of the nominal exchange rate, the deposit interest rate, consumer prices as a proxy for inflation and the international interest rate of Canada on the demand for money in Pakistan. The aim of this work is to scrutinize the effect of macroeconomic factors on real money demand in light of the pragmatic evidence from Pakistan and to re-evaluate the existing empirical research on money demand in the country.

The money demand function and permanent income are taken as scale variables. Moreover, the interest rate, foreign interest rate, exchange rate, inflation rate and total reserves are relevant determinants of the real demand for money. The paper also checks for effects of the nominal exchange rate, the domestic deposit interest rate, stock prices, a proxy for inflation and the international interest rate of Canada on the demand for money in Pakistan. The country's economy has faced chronic issues in the recent past. Political instability, oil price shocks, unemployment, high inflation, financial crises, and terrorism have been the main issues affecting the economy of Pakistan. The economy grew an average of 7% each year from 2002 to 2006. However, in 2007, it declined very sharply at the rate of 1.6% and it again recovered to increase by 3.8% in 2010.

The organization of this paper is as follows:

The first part of this study briefly explains the concept of the real money demand function and reviews studies that have been done on this topic, while the second section explains the stages and specifications of the model. The third section provides the data analysis and discussion of the results for Pakistan. Policy recommendations based on the analysis and concluding remarks are briefly highlighted at the end of the study.

2. Literature review

The Box-Cox technique (1964) is used to assess the fitness of the double-log shape for analysis. Furthermore, the movement of the LM is calculated based on the magnitude of inflation, open market operations, seigniorage, the international interest rate and the domestic interest rate, which demonstrates

the status of LM curve in the Mundel-Fleming model. Moreover, the effect of easy fiscal policy has also been assessed using the method of Romer (2006). Lee (2008), in analysing the theoretical and empirical issues surrounding money demand stabilization and structural adjustment policies in China, stated that stabilization occurs through a mechanism whereby the supply of money adjusts to its demand. This author found that demand for money is more sensitive to the nominal interest rate on financial assets in other developing countries than Arab countries. He further noted that the money demand function is inversely related to the exchange rate and international interest rate and, moreover, is steady over time in Arab nations.

Real money demand in India was studied by Krishna (1996) for the period of 1990 to 1996. He used GDP, expected price level, interest rate, and structural variables such as bank branches, population and agricultural output for the empirical analysis in his study. In India's money demand function, income was found to be the most important variable. The author also concluded that price levels, the interest rate and agricultural output have a negative association with money in the money demand function.

The long-term demand function for narrow and broad money in Mexico was studied by Guillermo et al. (1996) for the period of 1980:1-1994:1. An error correction model was used for the analysis, and the author concluded that there is a single long-run co-integrating association among real gross domestic product, the 91-day T-bill rate and real money balances. Nevertheless, the short-run findings revealed a positive association between broad money and income in the formulation of monetary policy.

Alkaswani and Al tawajairi (1999) described the determinants of money demand in Saudi Arabia (1977:1-1997:3). They used co-integration and error correction techniques for analysis and found that the exchange rate and real income have a positive association with the money demand function. In contrast, there is a negative association between the money demand function and the interest rate. They concluded that there is a stationary and significant long-run relationship of the demand for narrow money with other macroeconomic variables in Saudi Arabia. They also found that there is a minor effect of the interest rate on real money demand due to religious factors. For the analysis of narrow and broad money demand in Mozambique, the error correction technique was applied by Johansen in 1988 using monthly data from January 1991 to September 1997. She found that agricultural and industrial output and the return on financial instruments are the main determinants of broad money in Mozambique. Moreover, she

found a structural break in money balances from 1996 to 1997 because in this period, economic activities grew very rapidly. She concluded that the coefficients on industrial outputs and agriculture are highly significant in Mozambique, meaning that these variables play a vital role in the determination of money demand.

The narrow money demand function for Ethiopia was studied by Sterken (2004), who observed that in 1974 and 1991, Ethiopia faced large political changes, as well as serious shocks to population growth and drought in 1975 and 1985. Food shortages seriously affected narrow money demand and inflation. Narrow money demand was stable throughout the period under study. The author concluded that real income has a positive effect and inflation has a negative impact. The link between money demand and interest rates was studied by James Tobin using U.S. data. Tobin (1947) suggested that 'idle balance' is another term for transaction balances. He studied the relationship between the average level of idle balances and average interest rates in the period 1922–1941 and found an inverse relationship between the two. The money demand function is very strongly influenced by the interest rate. Other empirical studies resoundingly verified the findings of Tobin. However, the sensitivity of this relationship weakens in the case of a liquidity trap. Keynes stated that a liquidity trap may occur if interest rates are extremely low, but empirical studies have stated that a liquidity trap has never yet been seen. David et al. (1963) showed that there is a large sensitivity of money demand to interest rates if the movement of interest rates is very low. Stephen (1973) found that the tendency of the interest rate to move cannot occur when interest rates are very low. In fact, it can be seen that the sensitivity of the interest rate did not change from epoch to epoch under such circumstances. In the same way, Brunner and Meltzer (1971) estimated a money demand function with data from the 1930s; they calculated the same results as those found for money demand in the 1950s. These authors found that there was little evidence in favour of the existence of a liquidity trap during the Great Depression period. The studies of Brunner and Meltzer indicated that there is a high association between stabilization of the demand for money and the existence of a liquidity trap. Brunner and Meltzer's studies used data from the 1930s, and they argued that there was no liquidity trap during that decade. Their study concluded that the function of real money demand is steady for a long time. They also suggested that the money demand function has been stable over long periods

of time, but the results of money demand were not the same in different periods.

The elasticity of money demand was also measured by using the Baumol (1952) model. This author found that the relationship between income and money demand transactions is neither linear nor relative. Nevertheless, he stated that a change in income slightly influences the demand for money. Tobin (1956) offered the hypothesis of liquidity preference, which depicts two problems of the Keynesian theory of money demand. He argued that the inelasticity of future interest rates is a root of Keynes's liquidity preference. The rational agent may hold bonds or money. Friedman (1956) also suggested that rational agents desire to hold a definite quantity of real money balances for precautionary, transaction and speculation purposes, with wealth, return on money, equity and the inflation rate being functions of real money balances.

Greenaway et al. (2010) empirically investigated the cases of Pakistan, Mexico and Uruguay, where currency substitution took place due to the high inflation rate. Qayyum (2005) offered empirical evidence for the period of 1960-1969 in Pakistan and concluded that demand for real money balances is negatively associated with inflation and positively associated with income. Similarly, Khan (2005) and (2009) found long-run and short-run associations between real money demand and all other explanatory variables for the period of 1982 to 2002. He assessed time series data for Pakistan by using the autoregressive distributive lag approach and found that there is a positive association between real GDP and nominal money balances but that there is a negative relationship between the interest rate and the inflation rate. Javed (2005) stated that the interest rate is strongly influenced by the money supply.

Hooper (1978) and Hsu (2011) used the Cagan model and investigated the pressure of the inflation rate and currency substitution on real money demand in Pakistan and other nations. They found that inflation has a positive association with the demand for money. Lyoboyi and Pedo (2013) used data for the period 1970-2010 to estimate the money demand function for Nigeria. The ARDL bounds testing approach was used to analyse the data for that period. Real income, the short-term interest rate, and the expected exchange rate were found to be the main determinants of the demand for money in Nigeria. These authors found that the money demand function was significantly affected by real income and the interest rate and concluded that the coefficient of income was positive and of the interest rate

was negative. The coefficients on both variables were significant in the short term and long term. The international interest rate and exchange rate coefficients were insignificant, indicating that these variables did not influence the money demand function.

3. Data and Analysis

GOLD (1976) and Huchet-Bourdon (2013) describe the demand for real money as follows:

$$\text{Log}\,(m^d) = \log(y, tr, er, cint, inf)$$
$$\text{Log}(m^d) = c + a\log(y) + b\log(er) + d\log(inf) + f\log(cint) + \log(tr) + e \quad (1)$$

$$\text{Log}(y) > 0,\ \log(er) < 0,\ \log(inf) > \text{or} < 0,\ \log(cint) > 0 \text{ or } < 0,\ \log(tr) < 0 \quad (2)$$

Where;
m^d = the demand for money,
y = real income (GDP),
tr = total domestic reserve,
inf = cp = consumer prices as a proxy for inflation (annual %),
er = the exchange rate, the official exchange rate of Pakistani currency per US$ (period average), and
cint = the international deposit interest rate of Canada.

The explanations of the specific variables are given below:

Real income:

Real income is the annual growth rate of GDP. Real income may be defined as the market worth of all goods and services generated in a specific period in a country. For the purposes of this study, GDP is measured at a constant 1990 factor price in million PKR and has been taken as the annual growth rate of GDP in percent.

Consumer price:

The rate of change of the consumer price index is used as a proxy for the rate of inflation.

Interest rate:

The payment made by the borrower to the lender is called the interest rate. In the present study, it is the interest rate charged by commercial banks to

their customers; specifically, the deposit interest rate of Canada is taken as the foreign interest rate/international interest rate.

The nominal exchange rate (er) and the international interest rate (cint) have ambiguous predicted signs: they may be positive or negative. Therefore, they may influence real income in different directions. The depreciation of the real exchange rate has the following effect on real output:

$$\partial y/\partial er = -\,Ser \ln cint + Sr \ln cint / |J| > \text{or } lner < 0 \text{ and } > 0 \text{ if } lner < 0 \quad (3)$$

In Eq. (2), Ser and Scint are partial derivatives, where $|J|$ shows a positive Jacobian value. If the value of ln er is negative, then depreciation of currency would raise real output. The increase in demand for money decreases the international interest rate and boosts the domestic interest rate, which shifts the LM curve upward and raises real output:

$$\partial Y/\partial cint = Scint, lcint/|J| > 0 \text{ if } lcint < 0 \text{ and } < 0 \text{ if } lcint > 0 \quad (4)$$

The extended Box-Cox model is given as follows:

$$\mathbf{V}^{(\Omega)} = \mathbf{V}^{(\Omega)} - 1/\mathbf{\Omega}$$

where Ω is a parameter of any variable. The Box-Cox parametric transformation technique is used to reduce irregularities from problems of non-additivity, non-normality and heteroskedasticity. The application of the optimization condition shows that Eq. (1) will be converted into double-log form if Ω approaches zero, while it will be converted into linear form if the Ω =1- X^2 distribution has one degree of freedom in the static test, which is given by J (Ω). L (Ω) is the value of the maximized loglikelihood function. Moreover, the LM, ARCH, CUSUM and CUSUMSQ tests are also used to check the fitness of the model.

4. Estimation Methodology

The data have been taken from world indicators. m^d is in million PKR. Real m^d is derived from the CPI. The international interest rate is the deposit rate of Canada. The base year of the stock prices (sp) is 2010. The nominal exchange rate in Pakistan is rupees per US dollar. The inflation rate

is proxied by the consumer price index. Data from 1960 to 2016 are used for the empirical analysis.

4.1 ARDL Bounds Test

The long-term and short-term dynamics are determined by employing the ARDL bounds test and ECM, respectively. The ARDL approach is easily used to conduct analyses with I(0) or I(1) data, providing unbiased estimation of long-term associations among the variables. Following Shahbaz et al. (2013) and Rahman (2017), the ARDL model employed in this paper is:

$$\Delta \ln mt = ß + \sum_{i=1}^{m} ß_1 \Delta \ln mt\text{-}1 + \sum_{i=1}^{m} ß_2 \Delta \ln y_{t-1} + \sum_{i=1}^{m} ß_3 \Delta \ln tr_{t-1} + \sum_{i=1}^{m} ß_4 \Delta \ln er_{t-1} + \sum_{i=1}^{m} ß_5 \Delta \ln inf_{t-1} \sum_{i=1}^{m} ß_6 \Delta \ln cint_{t-1} + \eta_0 m_{t-1} + \eta_1 y_{t-1} + \eta_2 tr_{t-1} + \eta_3 er_{t-1} + \eta_4 inf_{t-1} + \eta_5 inf_{t-1} + \eta_6 cint + \varepsilon_0 \quad (5)$$

where the variables assessed in this research are m, y, tr, er, inf and cint. ε0 is a disturbance term and is serially homoskedastic, normally distributed and independent.

Eq. (2) depicts a particular type of error correction model (ECM) where the coefficients are not restricted; this is known as the "conditional ECM" of Pesaran et al. (2001). In Eq. (2), the six terms with addition signs depict the error correction dynamics, and the long-term association is presented in the second part (Shahbaz and Shrestha, 2005). The optimal lags are determined by using multiple information criteria (SC, AIC, HQ, etc.).

The short-run parameters are assessed by using the regular error correction mechanism (ECM), which is presented as follows:

$$\Delta \ln mt = ß + \sum_{i=1}^{m} ß_1 \Delta \ln mt\text{-}1 + \sum_{i=1}^{m} ß_2 \Delta \ln y_{t-1} + \sum_{i=1}^{m} ß_3 \Delta \ln tr_{t-1} + \sum_{i=1}^{m} ß_4 \Delta \ln er_{t-1} + \sum_{i=1}^{m} ß_5 \Delta \ln inf_{t-1} \sum_{i=1}^{m} ß_6 \Delta \ln cint_{t-1} + ECT_{t-1} \quad (6)$$

The speed of adjustment towards the long-run equilibrium is detected by using the error correction model. The long-run adjustment is presented by the negative and significant value of the error correction term (ECT) (Rahman and Mamun, 2016; Shahbaz et al., 2013).

The null and alternative hypotheses are as follows:

H0. There is no cointegration.

H1. There is cointegration.

The null hypothesis is checked by the F-test.

$$H0: ¥ = ¥_1 = ¥_2 = ¥_3 = ¥_4 = ¥_5 = ¥_6 = 0 \quad (7)$$

$$H_1: ¥ \neq ¥_1 \neq ¥_2 \neq ¥_3 \neq ¥_4 \neq ¥_5 \neq ¥_6 \neq 0 \quad (8)$$

Granger (1969) test suggested that it is not completely sufficient to comprehend about the association between two or more time series. So some associations may be spurious. Therefore, it is required to cross-check the causality of the results if the series are co-integrated.

The following VAR model is used to detect the absence of Granger causality:

$$_{Zt} = € + b_1 z_{t-1} + \ldots\ldots\ldots + b_p z_{t-p} + m x_{t-1} + \ldots\ldots\ldots\ldots + m_p x_{t-p+Эt} \quad (9)$$

$$q_t = \pi + c_1 q_{t-1} + \ldots\ldots\ldots + c_p q_{t-p+d} z_{t-1+} \ldots\ldots\ldots\ldots\ldots + d_p z_{t-p+} \varphi_t \quad (10)$$

Thus, H_0: b1 = b2= ….. = bp = 0 is tested against H_A: X Granger-causes Y. Similarly, H_0: $c_1 = c_2 = \ldots\ldots = c_p = 0$ is tested against H_A:z Granger-causes q. In each case, if the null hypothesis is rejected, then it implies that there is Granger causality. The Z and q series are in level form. $_{Эt}$ and φ_t are white noise error terms. There is cointegration between z_t and q_t if the coefficients of b_i or c_i are significantly different from zero. Thus, z_t escort q_t in the long run (Giles, 2011).

The short-run dynamics between z_t and q_t are represented by the coefficients of b_i or c_i. If the coefficient of b_i is not zero, z_t will move towards q_t in the short run. Similarly, if the coefficient of c_i is not zero, q_t will move towards z_t in the short run.

4.2 Assessment, findings, analysis and discussion

4.2.1 Unit root estimation

The results of the augmented Dickey-Fuller test are depicted in Table 1. It is concluded that all variables are stationary at levels under the ADF test and hence of order I(0), except cp, which is stationary at the 1st difference.

Table 1. Results of the unit roots test

Vars	Level (Intercept)	Level (Intercept and trend)	1st diff (Intercept and trend)	1st diff (Intercept and trend)
m	-1.44	-1.76	-6.69*	-5.79*
er	0.096	-1.80	-6.030*	-5.23*
y	-5.66	0.624	-8.41*	-3.23
cp	0.864	-3.23	-4.61*	-6.62*
tr	0.602	-2.32	-6.29*	-6.46*
cint	-3.377	-1.83	-7.31*	-6.78*

(*, ** and ***denote statistical significance at the 10%, 5% and 1% levels, respectively.)

The stationary level of the dependent and explanatory variables is detected by the ADF test. The results show that real M1 money demand, real income, the nominal exchange rate, and the international interest rate have unit roots in levels. However, the domestic interest rate (di), stock prices (sp), and inflation (inf) are stationary in levels. Nonetheless, all variables are stationary at first difference.

4.2.2 Diagnostic Tests of the Model

All the diagnostic tests indicate that the present model is fit for analysis. The R^2 value is 0.632 (Adj-R^2:0.591), which implies that almost 63% of the change in the dependent variable is explained by the model. The model is not spurious because the value of the DW statistic is 2.01. Furthermore, the computed F-statistic = 17.24 (Prob. 0.000) rejects the null hypothesis that the regressors have zero coefficients. The ARDL bounds testing methodology is employed to check the long-run relationship in the model. The Breusch-Godfrey serial correlation LM test is used for testing serial independence, while the CUSUM and CUSUM of squares tests are used to check the normality of the model. Heteroskedasticity is checked by using the Breusch-Pagan-Godfrey test. The results are presented in Table 2 and show that there is no serial correlation and the model is fit for analysis.

Table 2. Results of diagnostics tests

Sr. No	Test	Prob Results
01	Breusch-Godfrey serial correlation LM test	0.92
02	Breusch-Pagan-Godfrey heteroskedasticity test	0.26
03	ARCH test	0.40

Table 3. VAR lag order selection criteria

Lag	Lag L	LR	FPE	AIC	SC	HQ
0	-112.05	NA	3.78	4.54	4.76	4.62
1	175.01	496.86	2.44	-5.11	-3.54*	-4.51
2	239.24	96.33	8.71*	-6.20*	-3.27	-5.07*
3	274.1	44.24	1.05	-6.15	-1.88	-4.51
4	301.3	28.45	1.99	-5.82	-0.19	-3.66

The findings of the VAR lag order selection criteria are presented in Table 3. These results indicate that the optimal lag length is two (2) out of a maximum of 4 lag lengths.

4.2.3 Stability test of the model

The cumulative sum of recursive residuals (CUSUM) and cumulative sum of recursive residuals of squares (CUSUMSQ) tests suggested by Pesaran (1997) are employed to check the stability of the model for analysis. The CUSUM and CUSUMSQ statistics are displayed in Figures 1 and 2. The graphs of the CUSUM and CUSUMSQ remain within the boundaries at the 5% critical values; therefore, these statistics confirm the model stability. Thus, the model is fit for analysis.

Figure 1. Plot of the CUSUM test

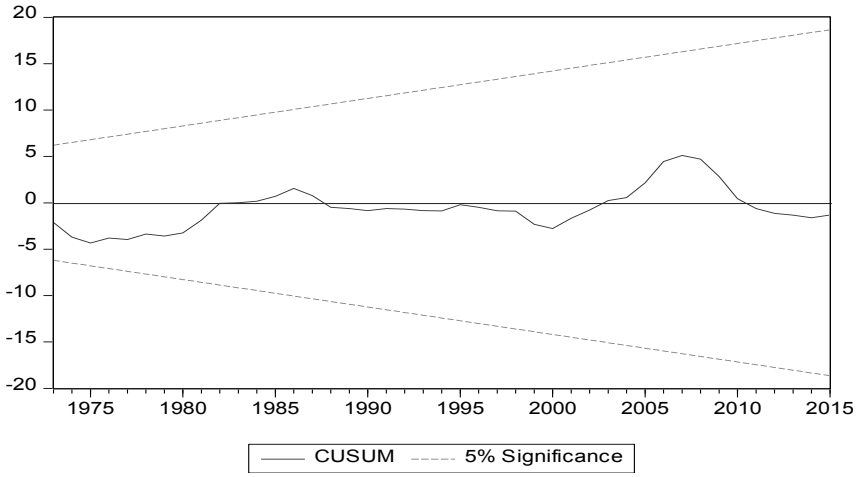
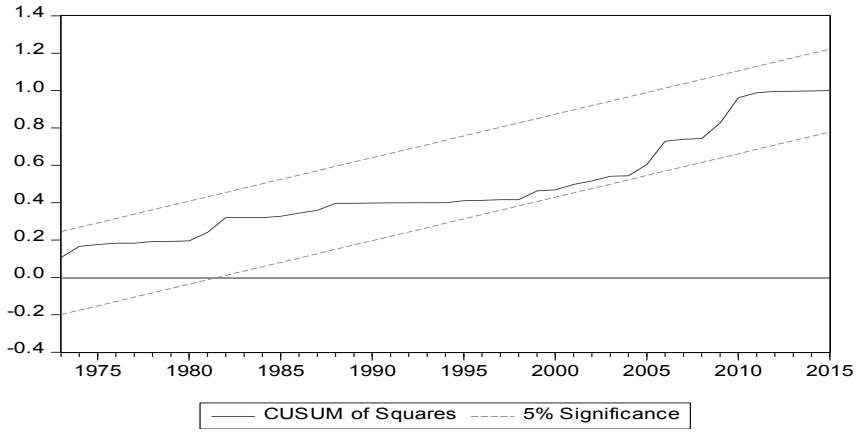


Figure 2. Plot of CUSUM of squares test



4.2.4 Ordinary least squares approach for the log of real money demand

OLS regression estimates are presented in Table 3. In this empirical estimation, the analysis of the first difference is not employed because Onafowora (2008) suggests that valuable information is vanished out and the results are not clear. The findings show that the five explanatory variables

account for 63% of the change in the real money balance. The significance of all explanatory variables is determined at the 5% level.

Table 4. Regression results for real money demand in Pakistan

Variables	Coefficients	Std. error	t-statistics	Prob.
c	3.66	0.37	0.66	0.46
Log(y)	-0.02	0.018	-1.31	0.19
Log(er)	-0.24	0.08	-3.06	0.00
Log(inf)	0.18	0.06	2.97	0.00
Log(cint)	-0.14	0.03	-4.53	0.00
Log(tr)	0.03	0.02	1.60	0.10
R^2	0.63	F-Stat	17.24	
Adj R^2	0.59	Prob (F-stat)	0.00	
SE	0.89	Sum of squ resi	0.34	

Real money demand balances have a negative impact on real GDP, but this is insignificant at even the 10% level. Real money demand is negatively influenced by the nominal exchange rate, and it is highly significantly and positively influenced by the international interest rate. These findings are contradictory to those of Smith (2004), who reported that the inflation rate affects demand for money insignificantly. As the exchange rate rises, the value of domestic currency is reduced with the increase in the demand for money. Smith (2004) suggested that the effect of wealth is greater than the effect of money substitution, and he stated that the behaviour of the international interest rate shows that the movement of capital has a greater effect than the borrowing cost of capital. Last, the demand for money is positively influenced by total reserves, the coefficient of which is significant at the 10% level.

Table 5. ARDL approach

Estimated Model	F-Stat F=7.554	Opt Lag 2 2
Md (y, er, cint, tr, di)	Pesaran et al. (2001)	
Critical values Signif level	Lower Critical Bound	Upper Critical Bound
1%	3.74	5.06
5%	2.86	4.01
10%	2.45	3.52

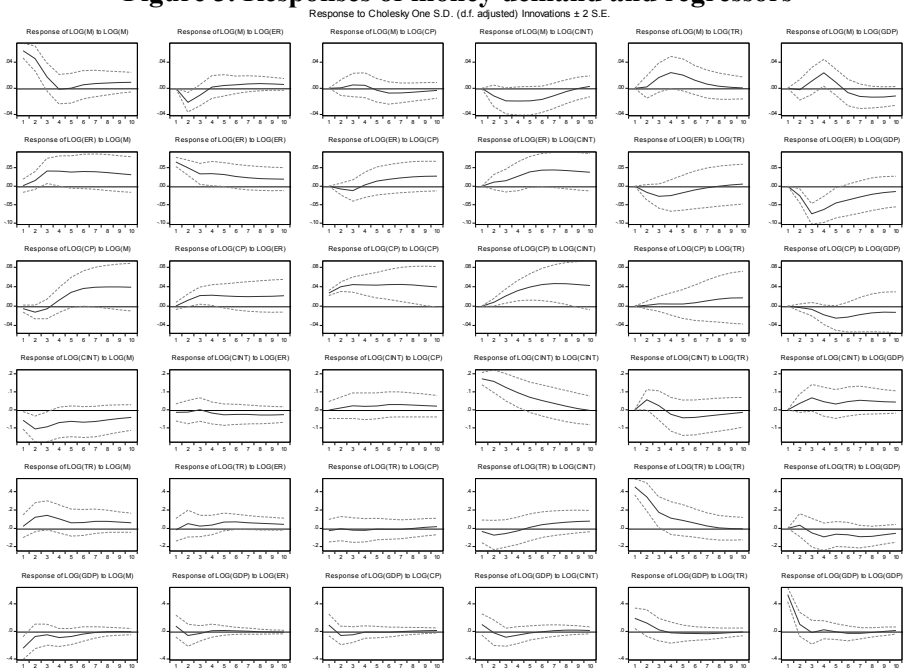
Note: Critical values from Pesaran et al. (2001) are shown above. The number of regressors is 5. The results from the Pesaran et al. (2001) and ARDL tests are depicted in Table 4. Therefore, it may be concluded that there is a long-term association between the dependent variable and regressors. This is because the computed F-statistic (7.554) is larger than the upper Pesaran et al. (2001) critical bound value at the 1%, 5% and 10% significance levels.

Table 6. Results of the error correction estimation

Var	**Coef.**	**Std. error**	**t-stat**	**Prob**
C	0.0402	0.017	2.261	0.028
D(m(-1))	0.0471	0.152	3.103	0.00
d(m(-2))	0.053	0.14512	0.366	0.716
d(cint(-1))	0.028	0.047	0.594	0.556
d(cint(-2))	0.047	0.039	1.215	0.232
d(cp(-1))	-0.010	0.0129	-0.885	0.381
d(cp(-2))	-0.008	0.01290	-0.739	0.464
d(er(-1))	-0.124	0.1087	-1.164	0.251
d(er(-2))	-0.149	0.1094	-1.375	0.177
d(y(-1))	0.005	0.0165	0.326	0.745
d(y(-2))	0.018	0.0170	1.081	0.286
d(tr(-1))	0.718	0.28240	2.553	0.015
d(tr(-2))	-0.958	0.24661	-3.892	0.001
ECT(-1)	-0.804	0.162	-4.947	0.000

The findings regarding Eq. (2) are depicted in Table 6 above. The lagged error correction term (ECT) with a specific value and sign is interpreted to present the short-run dynamics.

Figure 3. Responses of money demand and regressors



The negative value of the ECT is significant even at the 1% level. Furthermore, the value of the ECT coefficient is –80.4, which shows the speed of adjustment to the long-term equilibrium. In other words, within almost one year, 80.4% of the disequilibrium returns to the long-term equilibrium. Lag periods of m, cint, y and tr have positive and significant impacts on m. However, cp and er negatively affect m in the first and second lags. For that reason, it may be concluded that the overall impact of er, cint, y, tr and cp on m is time variant. These results are somewhat analogous to the findings of Alam et al. (2012) and Mohapatra and Giri (2015). Nevertheless, the findings are contradictory to those of Chebbi and Boujelbeane (2008).

It is observed in the first panel of Figure 3 that m responds to a shock to itself, and the response is initially high and significantly positive. Later, it has a decreasing trend. Nevertheless, the response becomes negative thereafter and remains above the boundary line between 6 and 10 years later. In the second panel of the figure, er responds to a shock in m, and the response remains positive throughout the period. Similarly, er responds to a shock in cint, and the response remains positive throughout the study period. In the third panel of the figure, cp responds to a shock in m, er, tr and cint, and the response remains positive except for GDP. In the fourth panel, cint responds to a shock in er and tr and the response remains negative, while the responses to shocks in y, m and cp remain positive. In the last panel of the figure, GDP responds to a shock in cint, m, tr, er, and cp, and the response remains on the boundary line throughout the period of research.

5. Conclusions

This paper estimates impact of the international interest rate, income, reserves, inflation rate and domestic exchange rate on real money demand in Pakistan by using econometric techniques. The Box-Cox technique shows that the double-log form is accepted at the 1% level; nevertheless, the linear form cannot be accepted at the 1% level. The OLS regression technique measures the covariance of variables. The estimated outcomes demonstrate that real income and the demand for money decrease or increase in the same direction, but the effect is insignificant. A high interest rate causes the value of domestic currency to appreciate, while high levels of the international interest rate and of expected inflation decrease the demand for real money. These results do not correspond with those of Fase (1998), who showed that money demand increases with high stock prices; however, the study of Bahmani (2002) showed that currency depreciation decreases demand for money in Thailand. The latter author also suggested that money demand in Hong Kong increases with a high foreign interest rate. Future research may be conducted in the different areas of international interest rates.

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WILLINGNESS TO PAY FOR CLEAN AND SAFE DRINKING WATER AND ITS DETERMINANTS IN INDUSTRIAL DISTRICT FAISALABAD, PAKISTAN

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Abstract

Contaminated drinking water results in high mortality rates in developing countries such as Pakistan due to the lack of access to safe and clean drinking water. Therefore, it is important to know the reasons for this situation. This study aimed to calculate the willingness to pay and its determinant for safe and clean drinking water. The data were collected from 300 households in the most polluted industrial district of Faisalabad, Pakistan. Descriptive analysis was performed to obtain detailed information about the socio-economic characteristics; the chi-square test was used to check the association between willingness to pay (WTP) and the socio-economic characteristics of the respondents. Then, the ordinary least squares method was applied to check the effects of the socio-economic determinants on willingness to pay. The results of the chi-square test show that variables such as household head's income, household head's age and the quality of water and whether the respondent had experienced a sudden shock by witnessing diseases had significant associations with willingness to pay for safe and clean drinking water. The regression results showed that the consumption of water in litres per day and household head's income had positive significant effects on the willingness to pay for safe and clean drinking water. It was suggested that targeted subsidy policies should be adopted for the low-income group of the country to improve the national situation**.**

JEL CLASSIFICATION: C0; F10; Q25.

KEYWORDS: SAFE AND CLEAN DRINKING WATER; SOCIO-ECONOMIC DETERMINANTS; WILLINGNESS TO PAY.

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1. Introduction

The poor quality of drinking water is a major problem that negatively affects human health in developing countries and is interlinked with most foetal diseases and diseases among children (WHO; 2004; 2008;). Drinking water can be contaminated with different chemicals and heavy metals released from different anthropogenic sources, which has become a global concern (Rapant & Krcmova, 2007). Most of the world's population lacks access to adequate and safe drinking water supplies and is subject to waterborne diseases and death, forcing many households in urban areas of developing countries to use treating water for drinking purposes. The increase in the urban population in developing countries has augmented the pressure on natural resources such as air and water. According to some estimations, out of 6 billion people on earth, more than 1 billion, i.e., one-sixth, lack access to safe drinking water. The millennium development goals (MDGs) aim to halve the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015 (UNO, 2010). Eighty countries around the world, accounting for 40 percent of the population, face water issues such as shortages and contaminated water supplies (World Vision resources). Four hundred million people worldwide suffer from malaria each year, and 17 million people suffer from onchocerciasis (river blindness) due to contaminated water. Scabies, trachoma, fleas, lice and tick-borne diseases are caused by contaminated water supplies (WHO, 2004). Agriculture and aquatic life are badly affected by this water pollution, which in turn affects human consumption (FAO, 2005).

The demand for safe and clean drinking water is increasing daily due to higher population growth, but its supply is not increasing at the same growth rate, resulting in shortages (United Nation Organization, Joint Monitoring Program for Water Supply and Sanitation) because the water has been polluted; long-term water pollution is mainly from industrial waste (Chen, 2001-2002). Therefore, developing countries such as Pakistan also face problems such as shortages of clean and safe water due to rising urbanization and water pollution (Special report: water crisis Agri-community, 2015; Emmanuel et al., 2009). However, developing countries such as Pakistan are more affected by a lack of clean and safe drinking water. Approximately 4 percent of the global population, or 21 million people, do not have access to safe and clean drinking water in Pakistan (Gulf news, 2018). In Pakistan, the majority of the population drinks ground water, but this pattern is currently shifting from ground water to disposable and filtered water (Bergstrom, et al.

1996). This shift is due to a high mortality rate (1.8 million people die every year globally), and 97,900 people die every year due to consumption of contaminated water (WHO-2004, The institute of social justice Pakistan). Shortage of safe and clean drinking water are a major issue in Pakistan, with an estimated 44 percent of the population lacking access to safe drinking water, while in rural areas, 90 percent of the population lacks such access (Soto Montes de Oca & Bateman 2006).

Water is a sub-sector in all countries and is largely ignored in Pakistan. Most people in Pakistan do not have access to safe drinking water due to socio-economic factors that affect the household's willingness to pay. As of 2005, approximately 38.5 million people did not have access to safe drinking water. By 2015, if this trend continues, 52.8 million people will be deprived of safe drinking water (Khan and Jawed, 2007).

Some of the waterborne diseases in Pakistan are mainly caused by the contamination of drinking water with sewage and industrial waste. Per the Pakistan National Conservation Strategy report of 1992, approximately 40 percent of the diseases are waterborne. The major diseases that are most connected with drinking water in Pakistan are diarrhoea, typhoid, skin infections and some strains of hepatitis. According to the International Union and Conservation of Nature (IUCN), 60 percent of infant deaths are caused by waterborne diarrhoea in Pakistan, which is the highest rate in Asia. It is estimated that water-related diseases cause annual national income losses of USD 380-883 million, or approximately 0.6-1.44 percent of the GDP.

The consumption of bottled water has been increasing consistently over the last century, even in developed nations with high-quality tap water. Consumer surveys mostly emphasize two things: dissatisfaction with tap water and health risk concerns (Doria, 2006). Secondary cities in developing nations with rapid population growth rates are largely neglected in the provision of social and municipal infrastructure, and poor sanitation facilities cause serious threats to the health and wellbeing of residents. Therefore, there is an inadequate supply of safe and clean drinking water in Faisalabad, which is similar to the situations in other districts of the country. The situation is worsening daily due to the rapid increase in population, which is the reason for the shortage of safe and clean drinking water supply, but the demand for safe and clean drinking water is increasing.

Faisalabad also faces a water supply shortage due to an increase in urbanization and an increase in the number of industries in Faisalabad. Therefore, this study aimed to evaluate the level of awareness among people

about clean and safe drinking water. It also aimed to calculate willingness to pay for safe and clean drinking water and its socio-economic determinants. The results of this study may be very helpful for policy makers to improve awareness levels. This study may also help policymakers increase public access to clean and safe drinking water.

2. Methodology

In this research study, data were collected from 300 households in different rural and urban areas of Faisalabad during 2017. This is a household-based survey, and the data were collected from households through convenient random sampling techniques for the purpose of research and to investigate whether people are aware of the quality of the available drinking water and its negative effects on their health. It was also to examine whether the households properly treated their drinking water and to calculate the willingness to pay for safe and clean drinking water.

Basically, two theoretical approaches (direct and indirect) were used to reliably estimate the household WTP for improvements in the service and quality of water (Altaf, et al. 1992).

(i). The direct approach uses stated preference: the individuals are simply asked directly how much they would be willing to pay for improved water service. This is called the contingent valuation method (CVM).

(ii). The indirect approach uses data on observed water use behaviour (revealed preference) that aims to reduce the effects of inefficient and unsafe water qualities to estimate WTP. To survive the water quality issues, consumers develop various coping strategies. The coping cost provides an estimate of how much additional money people are willing to pay for improved quality.

The direct contingent valuation approach was used in our model to estimate the economic value of non-market environmental goods through survey questions that brought out individual preferences regarding such goods (Carson, 1998).

Water is a good that is not traded in the market (non-market good); therefore, a non-market valuation method was required to estimate the WTP for safe and clean drinking water.

The chi-square test is most commonly used to check the association between variables by cross tabulation.

The chi-square test can be calculated quite easily and in a straightforward

manner with the following method:

$$\chi^2 = = \frac{(\mathbf{O}-\mathbf{E})\mathbf{2}}{\mathbf{E}}$$

where $\boldsymbol{\chi}^2$ is used for chi-square,
O is the observed frequency in each category, and
E is the expected frequency in the corresponding category.

The following linear regression model was used to calculate the effect of the socio-economic determinants of the willingness to pay (WTP) for safe and clean drinking water:

$$WTP = \propto + \beta 1\ (\text{litres water}) + \beta 2\ (\text{HHH age}) + \beta 3\ (\text{HHH income}) + \mu$$

Where:WTP= the willingness to pay of the households for the improved quality of safe and clean drinking water;
Litres water: how many litres of water are consumed per day, which is independently related to WTP;
HHH age: the household head's age;
Income= the household head's income, which is independently related to the WTP; and
μ= the random error term.

3. Results and discussion

Table 1 shows the personal information of the respondents and the means and standard errors. Most of the respondents (79 percent) had incomes of less than 50000 Pakistani rupees (Rs.) and had less than 10 years of education. The majority of the respondents were in the low- and middle-income group.

Table 1. Information regarding personal characteristics of respondents

Questions		Frequency	Mean	Standard error
Income of the household head (per month)?	50,000<	238 (79.3 percent)	0.1905	0.02294
	50,000>	56 (18.7 percent)		
Education of the household head (in years)?	10 years<	12 (4 percent)	0.9600	0.01133
	10 years>	288 (96 percent))		
Age of the respondent (in years)?	30 years<	274 (91 percent)	0.0867	0.01627
	30 years>	26 (8.7 percent)		
Gender of the respondent?	Male	135 (45 percent)	0.450	0.290
	Female	165 (55 percent)		

Source: own calculation

Table 2 shows the information regarding the respondents' answers to the following questions:

1) How do you define safe and clean drinking water?

The majority of the respondents defined bottled water and WASA supply[1] as clean and safe drinking water.

2) What is your main source of drinking water?

The majority of respondents used a red pump and bottled water as the main sources of drinking water.

3) In your opinion, what is the quality of the water you drink?

The majority of the respondents considered the quality of their drinking water to be average or good.

4) What factors affect the quality of safe and clean drinking water?

The majority of the respondents said that pollution and other issues were the

[1] The Water and Sanitation Agency (WASA) is the governmental body responsible for planning, designing, and maintenance of the water supply and sewage system.

main affecting the quality of safe and clean drinking water.

5) Why do you not purchase safe and clean drinking water?

Most of the respondents stated that they do not purchase safe and clean drinking water due to its high price and other factors.

6) Do any sudden shocks affect the purchasing power of safe and clean drinking water?

Most of the respondents stated that having the sudden shock of witnessing disease had a positive effect on the purchasing power of water.

Table 2(a). Analysis of respondents' answers to questions about safe and clean drinking water

Questions		Frequency	Mean	Standard error
How do you define safe and clean drinking water?	Filter	56 (18.7 percent)	2.43	0.054
	WASA supply	89 (29.7 percent)		
	Bottled	116 (38.7 percent)		
	Boiling	33 (11.0 percent)		
	Bore well/hand pump	30 (10 percent)		
What is your main source of drinking water?	Red pump	88 (29.3 percent)	2.71	0.052
	Bottled water	120 (40 percent)		
	Other	62 (20.7 percent)		
In your opinion, what is the quality of the water you drink?	Excellent	47 (15.7 percent)	2.34	0.045
	Good	115 (38.3 percent)		
	Average	127 (42.3 percent)		
	Bad	11 (3.7 percent)		

Table 2(b). Analysis of respondents' answers to questions about safe and clean drinking water

Questions		Frequency	Mean	Standard error
Which factors affect the quality of safe and clean drinking water?	Pollution	100 (33.3 percent)	2.51	0.075
	Industrialization	58 (19.3 percent)		
	Urbanization	30 (10.0 percent)		
	Other	112 (37.3 percent)		
Why you do not purchase safe and clean drinking water?	Expensive	95 (31.7 percent)	1.96	0.106
	Time constraints	6 (2.0 percent)		
	Less trust	14 (4.6 percent)		
	Other	38 (12.7 percent)		
Does having the sudden shock of witnessing disease affect whether you are likely to purchase safe and clean drinking water?	Yes	188 (62.7 percent)	0.380	0.030
	No	111 (37 percent)		

Source: own calculation

The results showed that 79.3 percent of the sample had lower incomes than the mean income of Rs. 50,000, while 18.7 percent had higher incomes than the mean income of Rs. 50,000, with a mean and standard error of 0.1905 and 0.02294, respectively.

The hypotheses defined for the test are given as follows:

H_o: WTP is not associated with HHH income.
H_1: WTP is associated with HHH income.
H_o: WTP preference is not associated with HHH education.
H_1: WTP preference is associated with HHH education.
H_o: WTP is not associated with HHH age.
H_1: WTP is associated with HHH age.
H_o= WTP is not associated with the quality of water.
H_1: WTP is associated with the quality of water.
H_o: WTP is not associated with a sudden shock.
H_1: WTP is associated with a sudden shock.

Table 3 presents the results of the chi-square test showing the association between willingness to pay and its determinants. According to the results, all variables[2] had a significant association with willingness to pay for safe and clean drinking water. The Pearson chi-square statistic value was χ^2= 2677.499 for the household head's income, and the p<0.000 indicated a very small probability of the occurrence of observed data under the null hypothesis of no relationship. The null hypothesis was rejected since p<0.05.

Table 3. Association between willingness to pay and its determinants

Variable	Coefficient	P value
Household head income	2677.499	0.000
HHH education	357.766	0.009
HHH age	1050.358	0.002
Quality of a water	63.848	0.001
Sudden shock	193.782	0.000

Source: own calculation

Table 4 reports the results of the regression analysis through the ordinary least squares method. This table shows the relationships between the different variables[3] and the willingness to pay for safe and clean water.

The following equation was estimated by regression analysis:

[2] House hold heads income, house hold heads education, household heads age, quality of a water, sudden shock.
[3] consumption of water per day (liters), age of respondent and household head income,

WTP= -1781.34+β_1(5.94) +β_2 (-8.810) +β_3 (0.014) +μ

If there was an increase of 1 unit in the consumption of water (litres), then there would be a 5.94 rupee increase in the willingness to pay, which indicates that the consumption of water had a positive relationship with willingness to pay. This means that people who consume more water are willing to pay for safe and clean water than people who have less demand.

If there was an increase of 1 unit in the age variable, then there would be an 8.810 rupee decrease in the willingness to pay. This indicates that age is negatively related to WTP and that young people are more willing to pay for safe and clean water compared to older people they understand its importance for health. If there is an increase of 1 unit in household income, then there will be a 0.014 rupee increase in willingness to pay. This means that household income was associated with willingness to pay for clean and safe water. Rich and educated people were more willing to pay for safe and clean water compared to poor and illiterate people because it was affordable for them and they understood its importance for health.

The R^2 value showed that 78 percent of the variation was explained by the litres of water, age and HHH income variables, and the R^2 showed the goodness of fit of the model. The adjusted R^2 was lower than the unadjusted, i.e., R^2 of 0.78<0.72.

Table 4: Socioeconomic determinants of willingness to pay for clean and safe drinking water (OLS)

Variable	Coefficient	Standard error	P value
C	-1781.34	1585.665	0.263
consumption of water per day (litres)	5.947	97.489	0.000
Age of respondent	-8.810	59.326	0.628
Household head income (per month)	0.014	0.005	0.002
R^2		0.78	
Adjusted R^2		0.72	

Source: own calculation

4. Conclusion and Policy Recommendations

The existing system of drinking water in Faisalabad is not reliable in

terms of either the services or quality to meet the requirements of the households. The demand for environmental goods, including safe and clean drinking water, a most important for health purposes. The study measured the WTP for improved quality of safe and clean drinking water services and water-avoidance behaviour for the improvement of drinking water quality. The demand for safe and clean drinking water could be higher if household income levels were high. If people had access to information and awareness regarding the health risks associated with the quality of contaminated water, then access could be improved. It was concluded that awareness, such as education and media exposure, had insignificant influences on the adoption of various water purification methods and hence on households' willingness to pay for safe and clean drinking water. It was also concluded that income and consumption of water had significant positive effects on willingness to pay for safe and clean drinking water.

The government should provide subsidies on the price of water and income to the most vulnerable groups in Pakistan to improve their access to safe and clean water.

The government should organize information programmes to raise awareness about the quality of drinking water. The government should support low-cost maintenance schemes in the WATSAN (water and sanitation sector) sector. The Environment Protection Agency and allied departments should ensure higher treatment coverage, including safe disposal of water from households. Government spending on the WATSAN sector is just 0.01 percent of the GDP. The government should revise its financing policy and invest more in the WATSAN sector to align with demand.

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DO ETHNIC POLARIZATION AND SOCIAL EXCLUSION REDUCE THE ECONOMIC GROWTH OF PAKISTAN?

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Abstract

In the modern era, multi-ethnic societies play a crucial role in managing relevant policies and its implication. Pakistan is a classic case study of multi-cultural identity, social malaise and a wide range of preferential ethnic policies. This study uses autoregressive distributed lag (ARDL) techniques for empirical analysis of this underlying nexus utilizing time series data from 1970 to 2015. The findings of this study reveal that ethnic diversity and social exclusion are enormous obstacles and deteriorate the economic growth of Pakistan. This study also suggests that diversity cannot be reduced; however, its effect can be minimized by providing an equal and peaceful society capable of ensuring the well-being of all people through cohesiveness.

KEYWORDS: ETHNIC DIVERSITY; SOCIAL EXCLUSION; ECONOMIC GROWTH; ARDL MODEL.
JEL CLASSIFICATION: O11; O5; O55; Z12.

1. Introduction

Diversity is a worldwide phenomenon. Ethnic heterogeneity and religious divisions are found in almost all countries and continents of the world (Azam, 2001). Many researchers have addressed the burning issue of ethnic diversity and consequences such as social conflicts and civil wars (José García Montalvo, Reynal-Querol, 2002). Recently, economists have become increasingly interested in these issues and emphasize the connections of ethnic diversity to investment, quality of government and growth (Alesina, Devleeschauwer, Easterly, Kurlat, Wacziarg, 2003; Easterly, Levine, 1997;

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Mauro, 1995).

Many developed and developing countries, Pakistan among them, have found themselves engulfed in ethnic conflicts. In addition to the human cost, these violent conflicts eat away at the meagre financial resources of these countries (Mengisteab, 2001). Ethno-linguistic fractionalization has been shown to have adverse effects on income, growth and overall macroeconomic policies, which is one explanation for poor institutional performance and an indirect cause of underdevelopment. Ethnic diversity generates a multi-cultural society, leading to conflicts within society as well as within firms (Reynal-Querol, Montalvo, 2005).

Flows of migrants from ethnic groups with vastly different cultures and norms are increasing in volume every year (Barth, 1998; R. H. Bates, 2000; Castles, 2000; Sung, 2014). In this contemporary world, most countries' borders and boundaries have morphed and apparently distant threats have metastasized into abrupt problems. Currently, the fight against global diversity has become a fight for worldwide peace. Alesina and Spolaore (2005), in their book titled "The Size of Nations," offer an economic analysis of the structure and change of political borders. In their opinion, to determine the optimum size of a country, one tracks the trade-off between the costs of heterogeneity and the benefits of size. In a large country, per capita costs may be low, but the heterogeneous preferences of a large population make it hard to deliver services and formulate policy.

The United Nations Development Programme (UNDP) Virtual Round Table defined exclusion as "any distinction, restriction or preference, which is based on any ground such as race, colour, sex, language, religion, political or other opinion, national or social origin, property, birth or other status, and which has the purpose of nullifying or impairing the recognition, enjoyment or exercise by all persons, on an equal footing, of all rights and freedoms." Levitas et al. (2007) showed that social exclusion affects the well-being of individual's equity and the cohesion of society as a whole. Social exclusion is more than poverty in income and becomes more critical when people or areas face a combination of linked problems, such as discrimination, lack of skills, low incomes, unemployment, poor housing, high crime and family breakdown. These problems are linked and mutually reinforcing (Amin, 2019a; Unit, 2004). Excluded individuals show an inability to participate in the basic social, economic and political processes of society (Peleah, Ivanov, 2013; Thorat, Neuman, 2012) and are more involved in breaking the rules and social norms (Popay et al., 2008).

The different patterns of exclusion increase day by day, which damages economic prosperity. The lack of basic rights directly motivates persons who commit crime, which itself is a cause of instability and severe depression (Amin, Ahmad, 2018). Cultural factors, among them ethnic diversity, have also received much attention for their potential impact in building cohesiveness, especially in relation to economic development. A strong but mixed relationship has been found between ethnic diversity, institutions and growth (Amin, 2019b; Ellis, Beaver, Wright, 2009; Hooghe, de Vroome, 2016), which is mostly based on geographical areas, such as crime rates that are different in heterogeneous communities compared to homogeneous communities (Ellis et al., 2009). Martinez, Nielsen, and Lee (2003) found that diversity based on gender, age and ethnicity had a consistent impact on homicides because of weak institutional situations.

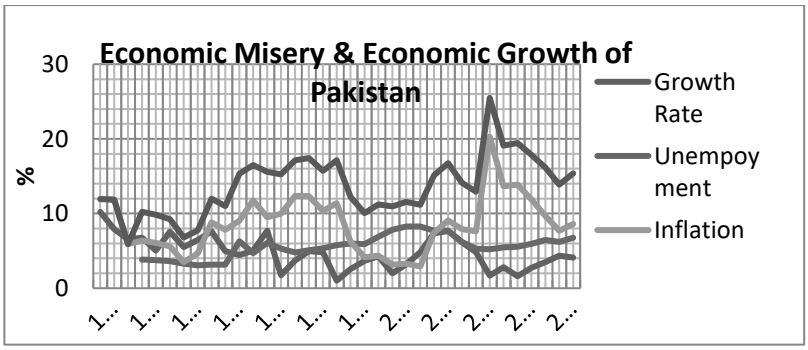
There is limited literature that shows a direct relationship between ethnic diversity and economic growth worldwide. Laurence and Bentley (2016) showed a negative association between community diversity and social cohesion. This study concluded that changes in community diversity lead to changes in attitudes towards the community. Van Staveren and Pervaiz (2015) showed a strong negative relationship between social exclusion and economic growth. Gören (2014) investigated the relationship between ethnic diversity, polarization, and economic growth. He argued that ethnic diversity has a strong direct negative impact on economic growth, whereas polarization has indirect effects on economic growth. Dincer and Wang (2011) showed a negative relationship between ethnic diversity and economic growth, supporting existing cross-country studies such as Alesina et al. (2003). Alesina and Ferrara (2005) showed mixed results regarding ethnic diversity, economic policies and outcomes.

Based on the above studies, there is still a nexus among ethnic diversity, social exclusion and economic growth that needs to be explored to better elucidate the policy implications. This study aims to find this relation in the case of Pakistan. This study shows a very interesting relationship among ethnic diversity, social exclusion and economic growth in Pakistan by using time series data from 1970 to 2015. The rest of the paper is as follows: Section II discusses the current socioeconomic situation of Pakistan, and the next section highlights the theoretical framework. Section IV contains the methodology, data source and empirical results, and the last section, which concludes the study, also gives policy recommendations based on the findings.

1.2 Overviews of Pakistan's Economy and Socio-economic Development

Pakistan is a developing country with a number of different cultures and norms. Pakistan is the 6th most populous country in the world**.** Unfortunately, Pakistan is among the countries whose per capita income is less than that of its neighbouring countries, and this low per capita income leads to a low saving rate and low investment. Pakistan has experienced the co-existence of volatile inflation and high unemployment, which are directly linked to the well-being of people. Most of the literature and policies in macroeconomics revolve around these issues, but the core problems of the economy remain unsolved. People living below the poverty line have been affected the most. This link of hyperinflation with the high unemployment rate badly affects the overall economy of the country. The results of poor governance, the low saving rate, backwardness in technology, less developed industry, improper utilization of natural resources and low capital development are manifest. Corruption is the root cause of abuse of all socioeconomic and macroeconomic activities. Our balance of payments (BOP) and balance of trade (BOT) are always in deficit, which affects the economic conditions of Pakistan. Foreign investors feel insecure investing in Pakistan due to security threats. Moreover, many investors and industry owners are shifting their foreign industries and capital from Pakistan to other countries.

Figure 1. Economic Misery and Economic Growth of Pakistan



Source: Compiled by the author. Data taken from WDI and IMF

Figure 1 shows the relationship between economic misery and the economic growth of Pakistan. The misery index (which simply adds the inflation rate and unemployment rate) is an indicator of the macroeconomic

situation of different countries. Inflation is one of the obstacles to development. In Pakistan, it has squeezed the majority of the population. The figure highlights the inflation and unemployment rates, which display sharp variations over time. Pakistan is an agrarian country, but due to improper utilization of natural resources, lack of modern technology, improper water storage capacity for irrigation purpose, unable to produce more output from agriculture. The lack of water management systems meet with floods and other natural disasters, which destroy lives and crops every year.

Table 1. Highlights of Pakistan's Economy

	1980-1984	1985-1989	1990-1994	1995-1999	2000-2005	2005-2009	2010	2011	2012	2013
GDP per Capita (Current US $)	340.3	355.1	417.2	483.9	553.0	919.4	1043.3	1230.8	1266.3	1275.3
Annual Inflation Rate (%)	8.434	6.096	10.53	8.89	4.23	11.70	13.88	11.91	9.68	7.68
Unemployment Rate (%)	3.66	3.26	5.42	5.62	7.78	5.97	5.55	5.95	6.45	6.2
Total Social Expenditure (% of GDP)	2.771	3.58	3.36	3.59	2.59	3.12	2.51	2.49	2.69	3.18
Total Public Debt (Billion $)	192.8	462.8	996	2106.8	3610.4	5445.8	9006	10767	12695	14293
Savings (% of GDP)	26.7	22.79	23.3	19.37	24.81	21.13	21.55	21.29	20.5	21.03
Exports (% of GDP)	11.55	12.6	16.49	16.30	15.14	13.56	13.52	13.97	12.4	13.28
Imports (% of GDP)	22.89	21.98	20.788	19.224	15.294	20.75	19.35	18.97	20.41	20.06
Foreign Direct Investment (% of GDP)	0.228	0.428	0.672	1.09	0.774	2.676	1.14	0.62	0.38	0.58
Current Account (% of GDP)	-2.63	-2.82	-3.984	-4.068	2.256	-5.046	-0.76	-1.03	-1.04	-1.91

Source: Compiled by the author. Data taken from the WDI and Pakistan Economic Survey (various issues)

In Pakistan, compared to other countries, ethnic diversity on the basis of linguistics is too high. In Karachi city, a number of ethnicity-based tensions persist between Urdu-speaking and non-Urdu-speaking groups. Different ethnic groups can exist in one nation peacefully if there is less discrimination, but if the struggle to win ethnic rights is constantly vulnerable, it transforms into a movement for an independent nation.

2. Theoretical background and Data Source

European colonialism sowed the seeds for ethnic conflict in the post-colonial era (Steinmetz, 2014). At the onset of colonization, boundaries were drawn with little or no consideration of distributions of actual indigenous people (Blanton, Mason, Athow, 2001). After the downfall of colonial rule, some of these diverse societies were transformed into states. Each colonial style is blamed as a source of underdevelopment. European powers, especially the British, are blamed for the policy of power decentralization. Britain governed her colonies using a divide-and-rule policy whereby local administrations, though answerable to colonial government, ruled their people along ethnic lines. The resulting ethnic divisions led to ongoing conflict and unstable governments.

In this vein, Easterly (2001) argued that ethno-fragmentations are not the root cause of civil wars and social unrest that impede economic development. Rather, high levels of poverty, failed institutions, and, to some extent, dependence on natural resources are the real causes of underdevelopment (Van der Ploeg, 2011). In the view of these authors, ethnic diversity by itself is not the cause of civil wars. In fact, it is said to have an offsetting effect. A very diverse society might even reduce violent conflict because "rebel cohesion" may be harder to create (Collier, 2000). These authors argued that political and economic failures cause wars (Collier 1998). They claimed that ethnic diversity is only problematic in such cases where one ethnic group accounts for 40-60% of the total population and dominates others. When the largest ethnic group surpasses 44% of the total population, the incidence of coups is high (Dion, Huber, 1997).

Recently, in political economy debates, many researchers have investigated the relationship between ethnic diversity and development through socioeconomic costs. Other, more optimistic scholars have showed the importance of ethnic diversity for economic advancement (Collier, 1998; Elbadawi, Sambanis, 2000; Watkins, Ferrara, 2005) and investment (Jose G

Montalvo, Reynal-Querol, 2005). Most of the literature has shown an ambiguous and controversial relationship between coexisting inflation and unemployment with economic growth. This puzzle is still part of the current debate, and did not confirm this issue. Although some studies and theoretical literature have shown a negative relationship between inflation and unemployment, others have shown that an inflation rate that is elevated over the long term is harmful to economic growth. In the literature, Philips and Lucas showed that inflation has positive effects in the short term and ignored the effect in the long term. However, short-term inflation causes insignificant economic growth and in the long term negatively affects economic growth. After that, Okun provided an objective basis for the simple concept of economic misery and found that higher levels of these variables have a negative effect on welfare.

On the basis of the abovementioned theoretical and empirical literature, this study follows the model of Bove and Elia (2017) by incorporating some socioeconomic variables for empirical analysis, such as

$$\text{Economic Growth} = \begin{array}{l}\text{F (ethnic diversity, social exclusion,}\\ \text{economic misery, globalization, total social}\\ \text{expenditure, gross fixed capital formation,}\\ \text{labour force participation)}\end{array} \quad (1)$$

The functional form of model is depicted as follows:

$$\boldsymbol{EG_t = \alpha_0 + \beta_1(ED)_t + \beta_2(SE)_t + \beta_3(EM)_t + \beta_4(Glob)_t + \beta_5(TSE)_t + \beta_6(GFCF)_t + \beta_7(LF)_t + Et} \quad (2)$$

where EG is economic growth; ED denotes ethnic diversity calculated by using the ethnic fractionalization index by Alesina et al. (2003); SE stands for social exclusion; EM is the level of economic misery, which is simply a combination of the inflation rate and unemployment rate; TSE stands for total social expenditure; GFCF stands for gross fixed capital formation; LF shows the labour force and Et denotes the error term. In the above equation, economic growth is a dependent variable, and the rest of the other variables are treated as independent variables.

Diversity plays a vital role in the stability and prosperity of a nation. The

concept of ethnic diversity has been associated with economic growth and economic development. The origins of the uneven distribution of ethnic and cultural division across countries create large challenges all over the world. Ethnic diversity shows the concept of different attributes, such as minority, group[1], race, caste, class, and outer group, in terms of insiders and outsiders, nationality and immigration status. The fractionalization dataset compiled by Alesina et al. (2003)[2] measures the degree of ethnic, linguistic and religious heterogeneity in various countries. Most definitions of ethnicity emphasize the sharing of a culture, in which the most prominent aspect is language (R. Bates, 2004). Organizing diversity is a major challenge for policy makers in managing ethnic conflict and ethnic tension in a cohesive society.

Social exclusion is a somewhat ambiguous concept that is measured in different ways but that conceptualizes the alienation or disenfranchisement of certain groups of people within a society. As Saith (2001) suggested, social exclusion is also multidimensional and involves not only exclusion from economic and political involvement (such as exclusion from the job market or from expressing political views) but also exclusion from a variety of areas of social life, such as exclusion from living in certain neighbourhoods and lack of access to medical provision, policing, or housing. The current study follows the definition of the UNDP (2013) of social exclusion and calculates the index using principal component analysis (PCA) of five variables, i.e., income inequality, infant mortality rate (IMR), out-of-school children of primary school age, lack of access to safe drinking water and emigrants. The misery index is the combination of the inflation and unemployment rates. An increasing value of the index means that the country faces more miserable conditions.

Total social expenditure comprises expenditure on education and health. The globalization index measures the economic, social and political dimensions of globalization. It captures changes in the level of globalization of a series of countries over a long-term period. Gross fixed capital formation refers to the net increase in physical assets (including purchases of second-

[1] For an overview, see Alesina and La Ferrara (2005). Recent exceptions are studies on the effects of geographical variability (Michalopoulos, 2012) and the duration of human settlement (Ahlerup, Olsson, 2012) on linguistic diversity.

[2] Alesina et al. (2003) developed the fractionalization scores in their study based on religious and linguistic diversity in 190 countries using current data from the Encyclopaedia Britannica Book of the Year (2001).

hand assets), including the production of such assets by producers for their own use minus disposals within the measurement period. The labour force participation rate is a measure of the active portions of the economy's labour force. The GDP growth rate is a main metric by which to judge the country's prosperity and people's welfare.[3] Therefore, the GDP growth rate has a direct interaction with well-being in any country.

3. Methodology and Data Source

In time series data analysis, it is necessary for all variables in the regression be stationary; otherwise applying Ordinary Least Square (OLS) on non-stationary data and residuals, which shows output as spurious regression.[4] To overcome this problem, the stationarity of variables is tested for a unit root. The autoregressive distributed lag (ARDL) bounds testing approach was first developed by M Hashem Pesaran, Shin, and Smith (1999) and later extended by M Hashem Pesaran, Shin, and Smith (2001). This approach does not impose the restriction that all variables under the study must be integrated of the same order. Therefore, the ARDL technique has the advantage of not requiring a specific identification of the order of the underlying data. ARDL (M Hashem Pesaran et al., 2001) involves estimating the unrestricted error correction model (URECM), which is specified as:

$$\begin{aligned}\mathbf{\Delta EG_t} = {} & \boldsymbol{\alpha_0} + \boldsymbol{\beta_i}(\boldsymbol{EG})_{t-1} + \boldsymbol{\beta_i}(\boldsymbol{ED})_{t-1} + \boldsymbol{\beta_i}(\boldsymbol{SE})_{t-1} + \boldsymbol{\beta_i}(\boldsymbol{EM})_{t-1} + \\ & \boldsymbol{\beta_i}(\boldsymbol{Glob})_{t-1} + \boldsymbol{\beta_i}(\boldsymbol{TSE})_{t-1} + \boldsymbol{\beta_i}(\boldsymbol{GFCF})_{t-1} + \boldsymbol{\beta_i}(\boldsymbol{LF})_{t-1} + \\ & \sum_{t=1}^{p} \boldsymbol{\phi_i}\,\boldsymbol{\Delta}(\boldsymbol{EG})_{t-1} + \sum_{t=0}^{p} \boldsymbol{\omega_i}\boldsymbol{\Delta}(\boldsymbol{ED})_{t-1} + \sum_{t=0}^{p} \boldsymbol{\gamma_i}\boldsymbol{\Delta}(\boldsymbol{SE})_{t-1} + \\ & \sum_{t=0}^{p} \boldsymbol{\delta_i}\boldsymbol{\Delta}(\boldsymbol{EM})_{t-1} + \sum_{t=0}^{p} \boldsymbol{\theta_i}\boldsymbol{\Delta}(\boldsymbol{Glob})_{t-1} + \sum_{t=1}^{p} \boldsymbol{\sigma_i}\,\boldsymbol{\Delta}(\boldsymbol{TSE})_{t-1} + \\ & \sum_{t=1}^{p} \boldsymbol{\tau_i}\,\boldsymbol{\Delta}(\boldsymbol{GFCF})_{t-1} + \sum_{t=1}^{p} \boldsymbol{\mu_i}\,\boldsymbol{\Delta}(\boldsymbol{LF})_{t-1} + \boldsymbol{\varepsilon_t}\end{aligned} \tag{3}$$

where $\boldsymbol{\alpha_0}$ is drift, $\boldsymbol{\varepsilon_t}$ is the error term, $\boldsymbol{\beta_i}$ is the long-run coefficients, Δ is the first difference operator and *p* is optimal lag lengths (could be either the same or different). EG, ED, SE, EM, Glob, TSE, GFCF, and LF are economic growth, ethnic diversity, social exclusion, economic misery, globalization, total social expenditure, gross fixed capital formation and labour force participation, respectively. The *F* test is used to test the existence of a long-run relationship. When long-run relationships exist, the *F* test indicates which

[3] For more information, see James M. Cypher. "The process of economic development" 2014, Fourth Edition, page no 53.
[4] For more information, see Lütkepohl, Krätzig (2004).

variable should be normalized. The null hypothesis of no co-integration among the variables in equation (3) is H_0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$, against the alternative hypothesis H_1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq 0$. If there is evidence of a long-run relationship (co-integration) of the variables, we move to the long-run coefficient, which is expressed as follows:

$$\begin{aligned}\mathbf{EG_t} = \ & \boldsymbol{\alpha_0} + \sum_{t=1}^{i=p1} \boldsymbol{\phi_i}\ (\boldsymbol{EG})_{t-1} + \sum_{t=0}^{i=q1} \boldsymbol{\beta_1}\,(\boldsymbol{ED})_{t-1} + \\ & \sum_{t=0}^{i=q2} \boldsymbol{\beta_2}\,(\boldsymbol{SE})_{t-1} + \sum_{t=0}^{i=q3} \boldsymbol{\beta_3}\,(\boldsymbol{EM})_{t-1} + \sum_{t=0}^{i=q4} \boldsymbol{\beta_4}\,(\boldsymbol{Glob})_{t-1} + \\ & \sum_{t=0}^{i=q5} \boldsymbol{\beta_5}\,(\boldsymbol{TSE})_{t-1} + \sum_{t=0}^{i=q6} \boldsymbol{\beta_6}\,(\boldsymbol{GFCF})_{t-1} + \sum_{t=0}^{i=q7} \boldsymbol{\beta_7}\,(\boldsymbol{LF})_{t-1} + \\ & \boldsymbol{\varepsilon_t}\end{aligned} \tag{4}$$

The orders of the lags in the ARDL model are selected by either the Akaike information criterion (AIC) or the Schwarz Bayesian criterion (SBC) before the selected model is estimated by ordinary least squares (OLS). The ARDL specification of the short-run dynamics can be derived by constructing an error correction model (ECM) of the following form:

$$\begin{aligned}\mathbf{\Delta EG_t} = \ & \boldsymbol{\alpha_0} + \sum_{t=1}^{1=p} \boldsymbol{\phi_i}\,\boldsymbol{\Delta}\,(\boldsymbol{EG})_{t-1} + \sum_{t=0}^{i=q1} \boldsymbol{\omega_i}\boldsymbol{\Delta}\,(\boldsymbol{ED})_{t-1} + \\ & \sum_{t=0}^{i=q2} \boldsymbol{\gamma_i}\boldsymbol{\Delta}\,(\boldsymbol{SE})_{t-1} + \sum_{t=0}^{i=q3} \boldsymbol{\delta_i}\boldsymbol{\Delta}\,(\boldsymbol{EM})_{t-1} + \sum_{t=0}^{i=q4} \boldsymbol{\varphi_i}\boldsymbol{\Delta}\,(\boldsymbol{Glob})_{t-1} + \\ & \sum_{t=0}^{i=q5} \boldsymbol{\varphi_i}\boldsymbol{\Delta}\,(\boldsymbol{TSE})_{t-1} + \sum_{t=0}^{i=q6} \boldsymbol{\varphi_i}\boldsymbol{\Delta}\,(\boldsymbol{GFCF})_{t-1} + \\ & \sum_{t=0}^{i=q7} \boldsymbol{\varphi_i}\boldsymbol{\Delta}\,(\boldsymbol{LF})_{t-1} + \boldsymbol{\psi ECM}_{t-1} + \boldsymbol{\varepsilon_t}\end{aligned} \tag{5}$$

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

$$\begin{aligned}\mathbf{ECM_t} = \ & \boldsymbol{EG}_{t-1}\ \ \boldsymbol{\alpha_0} - \sum_{t=1}^{i=p1} \boldsymbol{\beta_1}\,\boldsymbol{EG} - \sum_{t=0}^{i=q1} \boldsymbol{\beta_2}\,(\boldsymbol{ED})_{t-1} - \\ & \sum_{t=0}^{i=q2} \boldsymbol{\beta_3}\,(\boldsymbol{SE})_{t-1} - \sum_{t=0}^{i=q3} \boldsymbol{\beta_4}\,(\boldsymbol{EM})_{t-1} - \sum_{t=0}^{i=q4} \boldsymbol{\beta_5}\,(\boldsymbol{Glob})_{t-1} \ - \\ & \sum_{t=0}^{i=q5} \boldsymbol{\beta_6}\,(\boldsymbol{TSE})_{t-1} \ - \sum_{t=0}^{i=q6} \boldsymbol{\beta_7}\,(\boldsymbol{GFCF})_{t-1} \ - \sum_{t=0}^{i=q7} \boldsymbol{\beta_8}\,(\boldsymbol{LF})_{t-1}\end{aligned} \tag{6}$$

All coefficients of short-run equations are coefficients relating to the short-run dynamics of the model's convergence to equilibrium, and ψ represents the speed of adjustment.

The database of all variables used in this study is free to access. The data for the measurement of ethnic diversity were taken from the Database of the Cline Center for Democracy, University of Illinois, USA. For ethnic diversity, this study followed the methodology of Alesina et al. (2003) by utilizing the following formula:

$$\boldsymbol{FRACT_j = 1 - \sum_{i=1}^{N} S_{ij}^2}$$

where $\mathbf{S_{ij}}$ is the share of group i (i=1……N) in country j (Pakistan). The range of the result is between 0 and 1. Zero "0" indicates a homogeneous country and "1" a completely heterogeneous country. Social exclusion refers to the share of individuals excluded from a society that does not provide them with equal opportunity, such as the basis of income inequality, the infant mortality rate (IMR), out-of-school children of primary school age, lack of access to safe drinking water and emigrants. This study followed the UNDP (2013) definition of social exclusion and composed an index using principal component analysis (PCA). However, the data for these variables for Pakistan have been taken from the World Development Indicators (WDI) database.

Economic misery is the combination of inflation and unemployment rate (Economic misery = inflation rate + unemployment rate). The data on GDP growth, population density and total social expenditure (comprised of education and health expenditure as percent of GDP) were obtained from the WDI database. Data on gross fixed capital formation and labour force participation have been taken from the IMF and WDI. Globalization data have been taken from the KOF Globalization Index.

4. Results

Table 2. Augmented Dickey-Fuller and Phillips-Perron Unit Root Tests

Variables	ADF without trend Test Statistic		ADF with trend Test Statistic		PP without trend Test Statistic		PP with trend Test Statistic	
	At level	1st difference	At level	1st difference	At level	1st difference	At level	1st difference
EG	-5.931***	-11.080***	-5.9814***	-10.893***	-6.0404***	-18.044***	-6.1040***	-18.942***
ED	-2.5604	-2.3640**	-0.5575	-3.1934**	-0.8206	-1.7439**	-0.806347	-2.6115**
SE	0.1338	-5.3610***	-1.7108	-5.2885***	0.0052	-5.4045***	-1.7702	-5.3386***
EM	-2.5788*	-7.5530***	-3.2664*	-7.4261***	-2.4754*	-7.5530***	-3.265266*	-7.4261***
Glob	0.1338	-5.3610***	-1.7108	-5.2885***	0.0052	-5.4045***	-1.7702	-5.3386***
TSE	-1.41700	-6.09596***	-1.91612	-6.74232***	-1.42298	-6.11266***	-1.83112	-7.1743***
GFCF	-0.9108*	-5.5938***	-2.5198*	-5.5267***	-0.9345*	-5.6550***	-2.632518*	-5.5836***
LF	-0.97554	-6.58445***	-2.32289	-6.47278***	-0.97554	-6.58368***	-2.30662	-6.4703***

Source: Author's calculation. EG, ED, SE, EM, Glob, TSE, GFCF and LF show economic growth, ethnic diversity, social exclusion, economic misery, globalization, total social expenditure, gross fixed capital formation and labour force participation, respectively. * represents a significance level of 0.10 (10%), ** a significance level of 0.05 (5%) and *** a significance level of 0.01 (1%). ADF and PP represent the augmented Dickey-Fuller and Phillips-Perron tests for stationary, with and without trend, at level and first difference.

Table 2 shows the robust results regarding the unit root of the variables. To determine the stationarity of each variable, the study followed both criteria, i.e., the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root methodologies. All the variables are stationary at level I(0) and first difference I(1). The null hypothesis of both tests confirms that no unit root exists in the series. All the variables are a mixture of I(1) and I(0) of underlying repressors and none of I(2), so ARDL testing can be performed for further implementation of co-integration for long-run relationships among the variables.

Table 3. Bounds F-testing of Long-run/Short-run Relationships

Critical Values Bounds			**F-Calculated**
Significance	Lower Bound I(0)	Upper Bound I(1)	
10%	2.45	3.52	11.497293***
5%	2.86	4.01	
2.5%	3.25	4.49	
1%	3.74	5.06	

Notes: We perform a bounds test to see if there is evidence of a long-run relationship between the variables. Bounds F-testing critical values show the significance levels at 10%, 5%, 2.5% and 1%. *** shows the 1% level of significance.

Table 3 shows the result of the bound testing approach to observe the long-run relationship among the variables by following the methodology of Pesaran et al. (2001). According to the critical value of the Pesaran table, the upper bound values are 5.06, 4.49, 4.01 and 3.52 at the 1%, 2.5%, 5% and 10% levels of significance, respectively. The value of the F-statistic is 11.497, which is higher than the critical upper bound value at the 5% and 10% levels of significance using restricted intercepts and no trend. The value of the F-statistic shows the overall significant effect of the model, indicating that there is co-integration and that a long-run relationship exists among the variables.

Table 4. Long-Run and Short-Run Representation of the ARDL Model
Selected Model: ARDL (1, 0, 2, 0, 0, 1, 2, 1)

Long-Run Results		Short-Run Results	
Dep. variable: economic growth		Dep. variable: economic growth	
ED	-0.3188*** [0.0000]	ED	-0.5817** [0.0237]
	(-0.2772)		(-0.2612)
SE	-0.2503** [0.0275]	SE	-0.0353* [0.0942]
	(-2.9350)		(-0.4048)
EM	-0.2177** [0.0507]	EM	-0.2157** [0.0324]
	(1.8388)		(1.8615)
Glob	3.8388 [0.4938]	Glob	3.8044 [0.2772]
	(1.4706)		(1.4510)
TSE	0.2463* [0.0938]	TSE	0.0234 [0.4130]
	(1.1847)		(0.0294)
GFCF	0.4864** [0.02118]	GFCF	0.1839 [0.3713]
	1.3993		(0.2841)
LF	0.3131 [0.5193]	LF	0.5089 [0.2725]
	0.1975		(0.2312)
C	3.2517***[0.0000]	CointEq(-1)	-0.9910***[0.0000]
	2.8944		(-6.9950)
R2	0.84078		
Adjusted R2	0.80614	Ramsey RESET Test	(1, 32) 0.9420
DW	1.9207	Normality	0.8608
F-Statistics	3.7052	Heteroscedasticity	F(7,33) 0.7323
Prob(F-statistic)	0.0046	Serial Correlation	F(2,31) 0.8520

Notes: The table presents the long-run and short-run regression results. Standard errors are in ( ) and p-values in [ ]. *** shows the 1% significance of coefficients, ** shows the 5% significance of coefficients, and * shows the 10% significance of coefficients. C represents the value of the constant, where CointEq(-1) shows the speed of adjustment from the short-run to the long-run level.

Table 4 shows the long-run and short-run relationships among ethnic diversity, social exclusion and economic growth in Pakistan. The results indicate that ethnic diversity has a significant negative impact on the economic growth of Pakistan at the 1% level. The coefficient of ED is -0.31 for the long run and -0.58 for the short run, which indicates that a 1% increase in ethnic diversity brings a 0.31% decline in economic growth in the long run and a 0.58% decline in the short run. The results of this study match those of previous literature regarding the significant negative relationship between ethnic diversity and economic growth (Alesina and Ferrara (2005); Dincer and Wang (2011); Jose G Montalvo and Reynal-Querol (2005); Ofodile and Durham (2001)) and contradict those of Ahmad, Amin (2019), Baier, Bergstrand (2001), Watkins, Ferrara (2005) and Yanikkaya (2003). Higher ethnic diversity means more chances of conflict in society as well as in the marketplace, resulting in low income, which, in turn, is closely associated with low schooling, underdeveloped financial systems, distorted foreign exchange markets, and insufficient infrastructure (Alesina, Rodrik, 1994; Alesina, Spolaore, 1997; Alesina, Tabellini, 1989; Easterly, Levine, 1997; La Porta, Lopez-de-Silanes, Shleifer, Vishny, 1999; Sutherland, 1997).

Ethnic polarization brings about two fundamental setbacks, which are endemic diseases for economic development, i.e., rent-seeking and incongruity in public policies (Easterly, Levine, 1997). Ethnic and regional competition tends to degrade the institutional foundations of the economy; for instance, when ethnic and personal attachments rather than the rule of law are the governing principle, public institutional capacity will likely deteriorate (Nafziger, Auvinen, 2003).

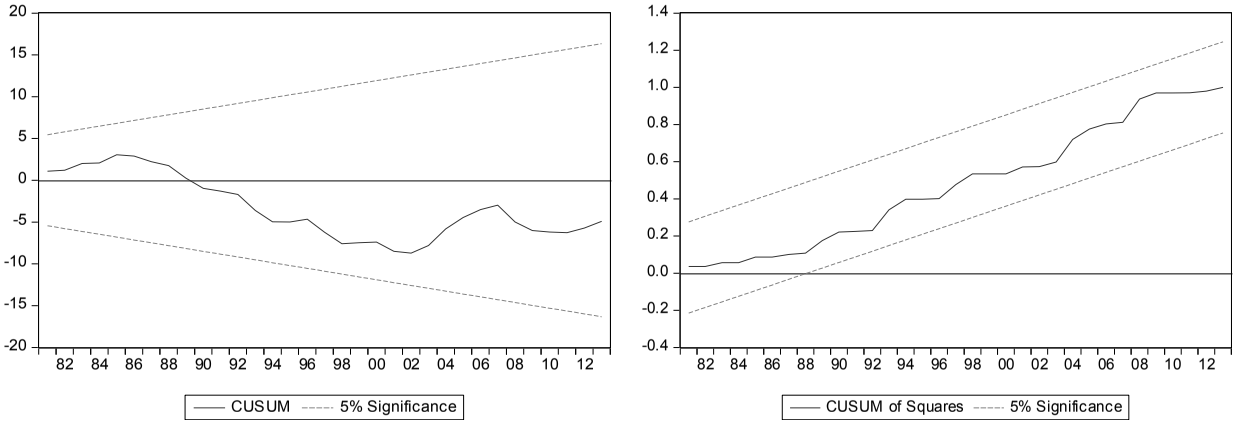
The social exclusion variable is significant at the 5% level, with a coefficient of -0.25. Socially excluded people are not treated equally in society in all aspects, bypass rules, regulations and social norms, and cause a vicious circle of poverty (Ananiev, Atanasov, Gerovska-Mitev, Shukarov, 2011; Mathieson et al., 2008). Related to addressing the undernourishment of society is halting the spread of malaise among civil society. The misery index shows a significant negative impact on the economic growth of Pakistan. This index is directly related to the economic position of the country, and as the misery index increases, socioeconomic costs increase, which makes the country still more miserable (Rotemberg, Woodford, 1999).

Globalization has a significant positive impact on economic growth, in line with theory and the literature (Aman (2007); Sa'idu, Umaru, and Yusuf (2014); Samimi and Jenatabadi (2014)). Social expenditure is one of the main

ingredients for economic development. The results show that social expenditure has a significant positive relationship with the economic growth of Pakistan. The literature also shows that countries that increase social expenditure improve their living standards (Zimmerman, Woolf, 2014). However, capital formation also has a significant positive impact on economic growth, as investment expands business and the living standards of society. The ECT (error correction test) value is -0.99, which indicates model convergence in the short run to the long run with changes in ethnic diversity, social exclusion, economic misery, globalization, total social expenditure, gross fixed capital formation and labour force participation. The results indicate that there is no problem of serial correlation and heteroscedasticity in the model. The values of the LM version and F-version are greater than 0.05, which shows that the null hypothesis (existence of serial correlation) is rejected and the alternative hypothesis (non-existence of serial correlation) is accepted. The results also indicate that the error terms are normally distributed, and there is no problem of heteroscedasticity.

It is important to check the stability of the ARDL model after applying all the formalities, as an unstable model is not valid for testing under these circumstances. To assess the stability of the model, CUSUM and CUSUMSQ tests (Mohammad Hashem Pesaran, Pesaran, 1997), as further developed by Brown, Durbin, and Evans (1975), are applied. Both tests plot the cumulative sums and sum of squares of residuals against time trends. Both tests reveal that the model is stable and accepts the null hypothesis. In the figure, CUSUM and CUSUMSQ statistics are well within the critical bounds, showing that the model is stable.

Figure 2. Diagnostic Graphs for Stability (CUSUM, CUSUMQ)



Notes: The straight lines represent critical bounds at 5% significance, where the residual line within the critical bounds shows the cumulative sum of recursive residuals and cumulative sum of squares of recursive residuals regarding the stability of the ARDL model.

5. Conclusion and policy implications

This study uses bound testing and the ARDL approach to demonstrate the long-run relationship between the dependent and independent variables. The results reveal a strong and significant negative relation between ethnic diversity and economic growth in Pakistan. Ethnic diversity deteriorates economic growth; for example, gender diversity creates more conflict among diversified groups, which, in turn, reduces economic development (Easterly, Ritzen, Woolcock, 2006). Diversity also expands the axes of social exclusion within society as well as the marketplace, as it is closely associated with low schooling, underdeveloped financial systems, distorted foreign exchange markets, and insufficient infrastructure (Alesina, Rodrik, 1994; Alesina, Spolaore, 1997; Alesina, Tabellini, 1989; Easterly, Levine, 1997; La Porta et al., 1999; Sutherland, 1997). Excluded people have no time or willingness to contribute to the growth of the national economy (Keen, 2000; Väyrynen, 2003).

Delhey and Newton (2005) and Dincer and Wang (2011) found that ethnic diversity diminishes development, on the one hand, and raises inequality, on the other hand, since ethnocentric members of an ethnic group favour their group members over others (Glaeser, Saks, 2006; Nafziger, Auvinen, 2003; Treisman, 2000; Van den Berghe, 1994). Socially diverse people are more involved in breaking institutional rules because they are not treated equally in society in all aspects (Ananiev et al., 2011; Mathieson et al., 2008). The study suggests that diversity cannot be reduced; however, its effects can be minimized by providing equal opportunity to all individuals in society. Governments can play an important role in creating a secure and peaceful society through strong institutional quality that shapes the economic life of a country in a variety of ways, such as by promoting more cohesiveness in society.

6. Limitations and prospects for future research

Every study has some limitations that allow researchers to interpret the results within proper parameters. This study also has some limitations of scope in covering the ground of diversity, social exclusion and their relationship with economic growth in Pakistan. Diversity is a multidimensional concept, i.e., with demographic, socioeconomic, political, geographical, and cultural components, and is dynamic in nature. Therefore, it is impossible to show that the variables included in this study are the only predictors of social exclusion

and diversity. This study also has some limitations regarding the weakness of the data on social exclusion according to the definition of the UNDP (2013); there are 24 variables related to the social exclusion index (through primary data). We have used only a few variables among them to calculate our social exclusion index by using secondary data, which were collected by different government departments.

Social exclusion is a multidimensional and very vast field that needs to be explored in the case of Pakistan by measuring the share of the population that is excluded from our society annually, monthly, and weekly.

Future researchers may collect their own data instead of using secondary data (interviews, surveys), which may increase the reliability and validity of the data. This study uses diversity on the basis of ethnicity and religiosity only, whereas other determinants of diversity, such as race and gender, may guide further research. The current study did not include any political or ideological variables, whereas the variation of political change has an impact on economic growth and is a new direction for future research.

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