GCU
ECONOMIC JOURNAL

CONTENTS

ARTICLES

Multidimensional Poverty of Housing Quality: A Spatial Analysis for Districts of Pakistan

*Dr. Muhammad Jamil

Abstract: An increase in living standards and housing quality is impossible without improving the housing quality. Housing quality provides many aspects of shelter and peace of mind. The present study used the quality of housing as an indicator of living standards and explored the deprivation in housing quality based on internal and external dimensions. These dimensions include indicators representing internal and external conditions, public provisions of the housing facilities available to the community, and users' perceptions of these facilities. For all this, we aim to create an index of multidimensional poverty for the quality of housing using the Alkire and Foster methodology (AF). The analysis is carried out for the Pakistan Social and Living Standards Measurement (PSLM) data, 2019-20. Regional decomposition of the index with spatial analysis is another study contribution. Regional decomposition of the index is the strength of the study.

1. Introduction

The global population is living in a shelter called a "flat" or "house". The shelter is also important for living, along with clothing and food requirements. The wellbeing of the individuals is subject to improvements in these. In addition to providing shelter, housing has an important bearing on work performance, educational attainment, national health, and the upbringing of the children (Bielestein, 1973). In developing countries like Pakistan, the unavailability of housing facilities for a low-income population group is an issue that is becoming swear with the addition of shortfall every year. According to Hussain (2007), Pakistan experienced an increase of 400,000 urban units' shortfall in Pakistan every year.

Similarly, the Human Rights Commission of Pakistan (2005) stated that over 60,000 people slept out in the open sky throughout the year in Lahore (the second largest city in Pakistan). According to the report, similar numbers are observed in other big cities in Pakistan. Along with the

*Professor of Economics, Ghulam Ishaq Khan Memorial Chair (SBP), Kashmir Institute of Economics, The University of Azad Jammu & Kashmir, Muzaffarabad. email: m.jamil@ajku.edu.pk

shortage of housing facilities, the quality of living standards in the existing houses is another issue.

Providing adequate housing facilities is an integral part of any meaningful economic development program. In recent years, different private housing authorities have provided quality housing in Pakistan. However, Cowasjee (2004) reported that the building control authorities violated the bylaws of private and cooperative building societies. Continuous violations of bylaws have contributed to the gradual transformation of cities into a jungle of low-quality housing without considering the negative effects on the environment and the citizens of the city. Many studies reported that low housing quality is associated with many stresses, deprivations, and infectious diseases (Loring, 1964; Martin, 1967; Mitchel, 1971; Bashir, 2002; Krieger & Higgins, 2002; Cattaneo et al., 2009; Irfan et al., 2017; Bah et al., 2018).

Studies have revealed that Pakistan, in general, and big cities, in particular, are experiencing problems related to low governance for housing policy, old housing standards, and no special consideration for housing quality. The quality of a house can be measured through the house's structure, facilities available in the house, and locality. Another factor contributing to the low quality of housing in the urban region is rapid urbanization. United Nations-Habitat (2007) reported that due to this high urbanization rate, the developing world's urban population will reach approximately six billion people by the end of 2050. This increase in population will put pressure on the existing housing supply, which may result in expensive and compromised housing facilities.

The term 'housing deficit' is repeatedly used in policy papers, academic papers, and newspaper articles. In academic literature, housing deficit can be divided into two categories: quantitative and qualitative. A quantitative housing deficit refers to a numerical shortfall in housing units. On the other hand, qualitative housing deficit refers to households living in sub-standard houses based on the locality of the houses, access to basic services, and condition of housing units (Bouillon, 2012; Bah et al., 2018; World Bank, 2020, Saiz et al., 2022). The present study intends to estimate the qualitative housing deficit.

Physical housing features, like the type of construction, location, habitation density level, and services available in the house, are significantly important. The study considers problems related to housing quality in different regions of Pakistan. The study measures an index for housing quality through deprivation scores related to the house's structure, deprivation scores related to facilities available in the house, and deprivation scores related to the locality of the house. Along with this, the study aims to estimate the determinants of high-quality housing.

Following the section of the introduction, section 2 presents the reviewed literature, section 3 presents the issues related to data and methodology and discusses in detail the construction of a multidimensional poverty index for housing, section 4 presents the results and their discussion, and section 5 presents the conclusion of the study.

2. Review of Literature

The standards for the definition of qualitative housing deficit vary significantly. Many studies used population density, deficiencies in infrastructure, and houses built with inadequate materials. Along with these aspects, studies extended the definition by adding other aspects such as telephone coverage (Lora et al., 2000), insecurity of tenure (UN-Habitat and UN-OHCHR, 2019), location and accessibility to markets (Acolin & Green, 2017). Table 1 presents indicators used by various studies for qualitative housing deficit.

Another way to estimate the qualitative housing deficit is through the households' satisfaction with their homes. A perception-based survey is conducted by Gallup (2021). The results based on the survey highlighted differences across countries regarding satisfaction levels. This indicates that the housing market varies across the world.

The estimates of the quality of housing very much depend upon the definition chosen for the analysis. A recent study analyzing the qualitative housing deficit in Peru (World Bank et al., 2021) shows that the housing deficit is equivalent to 23 percent of Peru's existing housing stock. The deficit could rise to 68 percent when a stricter definition of housing

adequacy is used for the analysis. Tusting et al. (2019) analyzed the improvement in housing quality between 2000 and 2015 in Sub-Saharan Africa. The authors reported an improvement in housing quality from 11 to 23 percent. On the other hand, in a recent study, Brown et al. (2020) assessed the home environments for protection from COVID-19 in developing countries. The study shows that to protect from the virus, 90 percent of the global poor are unable to comply with recommendation by the WHO fully.

The literature indicates that housing quality significantly affects socioeconomic outcomes, including education, health, social belonging, emotional wellbeing, political participation, job creation, and economical attainment (Thomson et al., 2009; World Health Organisation, 2018). Studies established a positive link between piped water and life satisfaction and improvements in overall wellbeing (Kremer et al., 2011; Devoto et al., 2012). Studies indicate that piped water helped to reduce diarrhea prevalence and mortality in young children (Jamison et al., 1993; Jalan & Ravallion, 2003; Galiani et al., 2005; Nabassaga et al., 2019).

Table 1: Indicators for the qualitative housing deficit

Reference	Indicators
Abdul-Rahman et al. (1998)	1. Layout of the flat (living area, kitchen, bathroom, bedrooms, balcony). 2. Workmanship (installation of ceiling, door, window, tiling, painting, plumbing work, electric wiring) 3. Garbage Collection System. 3. Environmental Conditions (air quality, noise traffic congestion). 4. Appearance/design 5. Internal Conditions (lighting, ventilation, and temperature). 6. Accessibility (shops, school, market, parking plots, playground/park).
Department of Housing and Urban Development (2004)	1. Sanitary facilities; 2. Food preparation and refuse disposal; 3. Space and security; 4. Thermal environment; 5. Illumination and electricity; 6. Structure and materials; 7. Interior air quality; 8. Water supply; 9. Lead-based paint; 10. Access; 11. Site and neighborhood; 12. Sanitary conditions; 13. Smoke detectors
Scotland Housing Quality Standards (2007)	1. Above the tolerable standard; 2. Free from serious disrepair; 3. Energy efficient; 4. Modern facilities; 5. Healthy, safe, and secure.
Housing Corporation England (2007)	1. Internal environment (size, layout, service provision); 2. Sustainability; 3. External environment (building for life)

Building Research Establishment, London (2007)	1. Exterior architecture; 2. Internal fabric finishes; 3. Electrical design systems; 4. Summertime overheating; 5. Sustainability; 6. Site planning; 7. Outer material; 8. Sourcing of repairable items; 9. Visual environment; 10. Maintainability; 11. Interior design; 12. External and internal details; 13. Air quality; 14. Space planning; 15. Junction detail; 16. Heating comfort
Chohan et al. (2015)	1. Architecture and site planning; 2. Structure; 3. Construction; 4. Building Services 5. Health safety & security; 6. Users' comfort; 7. Maintenance; 8. Sustainability
UN-Habitat (2016)	1. Access to improved water; 2. Access to improved sanitation facilities, 3. Sufficient living area, 4. Structural quality/durability of the housing unit, 5. Security of tenure
Tusting et al. (2019)	1. Quality of water and sanitation; 2. Sufficient living area; 3. Durable construction
World Bank (2021)	1. Access to improved water; 2. Access to improved sanitation; 3. Adequate living space; 4. Durable material and good structural quality; 5. Security of Tenure; 6. Access to electricity; 7. Access to clean cooking

Similarly, other studies established the positive impact of improved sanitation and health outcomes, especially in children (Duflo et al., 2015). Durable structure quality has positively affected overall health and adult welfare and negatively affected child mortality (Cattaneo et al., 2009; Bah et al., 2018). Studies reported the negative effects of overcrowding on health (Bashir, 2002; Krieger & Higgins, 2002; Cattaneo et al., 2009; Irfan et al., 2017). The overcrowding also causes the underdevelopment of children because of a lack of privacy (Goux & Maurin, 2005; Evans, 2006).

Several studies tried to estimate housing poverty or housing inadequacy, or housing quality in Pakistan (Sandhu, 1972; Ashfaq, 1974; Chhattari, 1978; Farooq, 1978; Zaki, 1981; Cowasjee, 2004; Hussain, 2007; Chohan et al., 2015; Ijaz & Rashid, 2015). These studies used one or a few indicators for the deprivation in housing quality. None of these studies tried to estimate housing quality at the district level. Based on the reviewed literature, several gaps emerge. The present study contributes to the existing literature in several ways. First, it provides a detailed review of existing literature on methods of estimating poverty in housing quality. Second, the study proposes a new method to estimate multidimensional poverty in housing quality. Third, it adds to the literature that estimates multidimensional poverty for Pakistan, its provinces, rural and urban regions, and its districts.

Fourth, the study decomposes the multidimensional poverty in housing in Pakistan to determine the contribution of different regions and dimensions. Fifth, mapping of the estimates of multidimensional poverty is carried out in the paper for spatial analysis.

3. Methodology

The term standard of living is observed in the scientific and common language. Because of its use in multiple disciplines, there are many definitions of standards of living. According to Czeslaw and Leszek (1999), the standard of living is represented by the degree to which human needs are satisfied, which results from the consumption of material goods and services and from using the amenities of both the natural and social environment.

The present study analyzed the multidimensional poverty for housing quality in districts of Pakistan by measuring, decomposing, and representing on a geographical map to conduct the spatial analysis. Section 3.1 presents the steps involved in measuring multidimensional poverty for housing quality. Section 3.2 discusses the procedure for decomposing the multidimensional poverty index of housing quality.

3.1. Measure of Multidimensional Poverty for Housing Quality

Various studies used aggregation of different adequacy dimensions to measure housing quality (see Table 1). The present study used ten dimensions to measure multidimensional poverty in housing quality. The Alkire-Foster method developed by Alkire and Foster (2011) measures the multidimensional poverty index for housing quality. Steps, based on the Alkire-Foster method, for the estimation of MPI for the quality of housing in Pakistan and its districts are as under:

Step 1 - Unit of Analysis: The present study used household as the unit of analysis to estimate the multidimensional poverty in housing quality for the district of Pakistan.

Step 2 & 3 - Dimensions & Indicators: Based on the literature on housing quality, the present study used ten dimensions to calculate the MPI for

housing quality. Overall, twenty indicators are used for these dimensions. Detail of these dimensions and indicators is presented below:

- **D_1 – own:** Ownership of the house;
- **D_2 – den:** Population Density (ratio of HHS and number of rooms); The study used overcrowding (more than three people occupying a room; UN-Habitat, 2007)
- **D_3 – inf:** Structure of the house (material used in floor, walls, and roof);
- **D_4 – ene:** Modern energy sources availability (fuel for cooking, heating, lighting);
- **D_5 – dwa:** Drinking Water Availability (Drinking water source, Time takes to get the water, the distance of the water source, Sufficient availability of water);
- **D_6 – wcw:** Water for Cooking and Washing (Water source for cooking and washing);
- **D_7 – toa:** Toilet Availability (Flush Available, Sharing toilet with a non-member of the household);
- **D_8 – gco:** Garbage Collection System (Garbage collection facility at home, Time required to dispose of the garbage);
- **D_9 – mcs:** Availability of Modern Communication Services (Availability of internet or landline at home);
- **D_{10} – cln:** Cleanliness inside the home (Place for hand washing in the house)

$$x_{ij} \subset \mathbb{R} \quad \forall \quad i = 1,2, \dots, n \quad \& \quad j = 1,2, \dots, d$$
(1)

Where x_{ij} represents indicator x in dimension j for household i.

Step 4 & 5 – Deprivation Cutoffs & Calculate deprivation in each dimension: For the identification, if the household is poor or not poor, we set the threshold, also called as "poverty line" or "deprivation cutoff (Z_j). A household is said to be poor or deprived in any indicator if $x_{ij} < Z_j$, otherwise, they are categorized as non-poor or not deprived. The deprivation cutoffs are summarized in vector Z. We assign a "deprivation status score" g_{ij} to each household in each dimension based on their deprivation status. Here, g_{ij} is equal to 1 if household i is deprived in

dimension j. If household i is not deprived in dimension j then g_{ij} is equal to 0.

$$g_{ij} = \begin{cases} 1 & x_{ij} < Z_j \\ 0 & otherwise \end{cases}$$
$$(2)$$

Figure 1 presents the deprivation of the household in case of the availability of a toilet in the house. Figure 2 presents the deprivation of the household in case of the availability of a clean water facility. The household is considered non-poor in this dimension if the government does not provide water or it is not accessible within a short time or distance. Similarly, deprivation in other dimensions is determined, and a value of 1 is assigned if deprived and 0 otherwise. Likewise,

Step 6 – Weights to each dimension: Normalized weights w_j to each dimension of housing quality d_j is assigned.
$$w_j > 0 \qquad \sum_{j=1}^{d} w_j = 1$$
$$(3)$$

Step 7 – Weighted sum of deprivation status scores: Weighted sum of deprivation status scores of each household in all dimensions d are used to identify whether the household is poor or not poor. An overall "deprivation score" for each household i is computed by adding the deprivation status scores of all dimensions, each multiplied by their corresponding weights.

$$c_i = \sum_{j=1}^{d} w_j\, g_{ij} \qquad c_i \in [0,1]$$
$$(4)$$

To calculate the MPI for housing quality, the present study used equal weights for each of its ten dimensions.

Step 8 – Poverty cut–off and identification of poor: The poverty cutoff "k" reflects the minimum deprivation score a household must be suffering simultaneously to be considered poor. In the literature, there are three approaches to setting the poverty cutoff. The union approach identifies

people as multidimensionally poor if they experience at least one measured deprivation. For the union approach, according to Atkinson (2003), poverty cutoff "$0 < k \leq \min \{w_1, w_2, \ldots, w_d\}$" The intersection approach identifies as poor only those households who are deprived in all the indicators simultaneously. For the intersection approach, the poverty cutoff is $k = 1$. The Alkire-Foster method uses a dual cutoff approach, which sets a poverty line 'k' that can range between 1 and a total number of indicators included in the measure. Poverty cutoff k is set to identify the poor. A household is said to be poor if $c_i \geq k$. Otherwise, the household is identified as non-poor. Like Alkire and Foster (2011), the present study used conventional cutoffs of 33.33% and 66.66% to identify the poor.

$$P_i = \begin{cases} 1 & c_i \geq k \\ 0 & otherwise \end{cases}$$
$$(5)$$

Where, P_i represents the poverty of a household i having a value of 1 if the household is multidimensionally poor and 0 otherwise.

Step 9 – Head Count Index for housing quality (H): Head Count Index for housing quality (H) is obtained by dividing the number of poor people (n_P) with the total population (N).

$$H = \frac{n_P}{N}$$
$$(6)$$

H is a useful measure, but it does not increase if a household becomes more deprived in any dimension, nor can dimensions break it down to analyze how poverty differs among groups. For this reason, we used an adjusted multidimensional poverty index.

Step 10 – Average Poverty Gap (A): According to the focus Axiom, while measuring poverty, the focus should remain only on those identified as poor. The average poverty gap is the average number of deprivations a poor household suffers in terms of housing quality. It is calculated by adding the proportion to each person's total deprivations and dividing it by the total number of poor persons. Simply put, it is the average of the deprivation

scores among the poor only. This also reflects the intensity of poverty. Technically, this enables us to obtain the censored deprivation score vector $c(k)$ from c, such that $c_i(k) = c_i$ if $c_i \geq k$. Otherwise, $c_i(k) = 0$.

$$A = \frac{1}{n_P}\sum_{i=1}^{n} c_i(k)$$
(7)

Step 11 – Adjusted Multidimensional Poverty Index for Housing Quality (M_0): Adjusted Multidimensional Poverty Index M_0 for housing, quality is calculated as the product of two components: the share of the population who are multidimensionally poor or multidimensional headcount ratio (H), and the average of the deprivation scores among the poor only, or the intensity of poverty (A).[1] Technically, this can be written as:

$$M_0 = MPI = H \times A = \frac{n_P}{N} \times \frac{1}{n_P}\sum_{i=1}^{n} c_i(k)$$
(8)

Equation (8) indicates that a reduction in M_0 for housing quality is possible either by reducing H or by reducing A. If the reduction in M_0 occurs simply by reducing the number of people who are marginally poor in living standards, then H decreases and A may not. On the other hand, if a reduction in M_0 occurs by reducing the deprivation of the poorest of the poor, then A decreases, but H may not. M_0 can also be obtained as the average of censored deprivation scores.

$$M_0 = \frac{1}{n}\sum_{i=1}^{n} c_i(k)$$
(9)

---

[1] Adjusted Head Count Ratio (M_0) can be calculated with ordinal as well as cardinal data. However, cardinal data are required to calculate Adjusted Poverty Gap (M_1) and Adjusted Squared Poverty Gap (M_1). In the present study, we have only ordinal data for indicators of the housing quality.

The present used the above-stated procedure to calculate the multidimensional poverty in housing quality for overall Pakistan, provinces of Pakistan, rural-urban regions of Pakistan, and districts of Pakistan.

3.2. Decomposition of M_0

Adjusted Multidimensional Poverty index for housing quality can be decomposed into different regions. This is possible because the entire population can be divided into m mutually exclusive and collectively exhaustive groups. In this case, M_0 can be expressed as the weighted average of the M_0 values of m subgroups, where weights are their respective population shares. We denote the population, achievement matrix, and the adjusted headcount ratio of subgroup s by n^s, X^s, and $M_0(X^s)$, respectively. Consequently, the overall M_0 can be expressed as:

$$M_0 = MPI = \sum_{s=1}^{m} \frac{n^s}{n} M_0(X^s)$$
(10)

This subgroup decomposability helps us to understand the contribution of different subgroups to overall poverty (contribution of provinces to overall multidimensional housing poverty of Pakistan, contribution of rural and urban regions to overall multidimensional housing poverty of Pakistan, contribution of districts to overall multidimensional housing poverty of Pakistan). Here, we can observe that the contribution of a subgroup to overall multidimensional poverty of housing quality depends on the poverty level of the subgroup and its population share.

Further, we can decompose the multidimensional poverty in housing to see the contribution of each indicator to overall poverty. For this, first, the censored headcount ratio of an indicator (h_j) is obtained as the proportion of the population which is multidimensionally poor and is simultaneously deprived in the indicator in question. By property, M_0 can be expressed as an average of the censored headcount ratios of indicators according to their relative weights.

$$M_0 = MPI = \sum_{j=1}^{d} W_j\, h_j = \sum_{j=1}^{d} W_j \left[\frac{1}{n} \sum_{i=1}^{n} g_{ij}(k) \right]$$
(11)

Where, $g_{ij}(k) = g_{ij}$ if $c_i \geq k$. Otherwise, $g_{ij}(k) = 0$. Then the contribution of indicator j (ϕ_j) to M_0 can be written as:

$$\phi_j = W_j \frac{h_j}{MPI} = W_j \frac{h_j}{M_0}$$
$$(12)$$

The present study decomposed the contribution of each dimension in the overall multidimensional housing poverty of Pakistan, the overall multidimensional housing poverty of rural and urban regions, and the overall multidimensional housing poverty of districts of Pakistan.

Data from the Pakistan Social and Living Standard Measurement (PSLM) survey for 2019-20 issued by the Pakistan Bureau of Statistics (PBS) is used for empirical analysis. The PSLM survey is district representative and contains data from 160654 households.[2] Figure 3 presents the geographical boundaries of the provinces and districts of Pakistan. Gilgit-Baltistan, Azad Kashmir, and India-administered Kashmir are not part of the analysis because of the unavailability of the data.

Figure 4 presents the population share of each district of Pakistan. Districts shaded with light yellow indicate a low level of population share, whereas districts shaded with dark green indicate a high level of population share. Districts of Punjab relatively have more population share compared to districts of Khyber Pakhtunkhwa (KP), Sindh, and Balochistan. According to PSLM 2019-20, 53.4 percent of the households are from Punjab, 26.5 percent are from Sindh, 14.6 percent are from KP, and 5.5 percent are from Balochistan.

4. Results
Households' decision about housing is not about the shelter but also about providing comfort to them and their family members. For this, a house should have some basic level of facilities. The availability of these facilities

---

[2] List of the districts is provided in Appendix A.

defines the quality of housing. The housing quality across all Pakistan regions is not the same. The present study calculated the multidimensional poverty index for housing quality across different regions of Pakistan.

Figure 4 presents the MPI for housing quality in Pakistan and its provinces. Multidimensional poverty in housing is highest in Balochistan, followed by KPK, Punjab, and Sindh. Likewise, the adjusted multidimensional poverty index is highest for Balochistan, followed by KPK, Sindh, and Punjab. The ranking of deprivation in housing across provinces is the same as the estimates of income poverty across these provinces (In 2018-19, poverty at the national level stood at 21.5%, whereas in Balochistan, it was estimated at 40.7%, KPK 27%, Sindh 24.6%, and Punjab 16.3%).

On the other hand, looking at the contribution of the provinces to national poverty, the contribution is highest for Punjab, followed by Sindh, KPK, and Balochistan. This is because of the high population shares of Punjab and Sindh in the overall population of Pakistan. The ranking of these provinces for multidimensional poverty is the same when a cutoff of 0.6666 is used. This indicates that multidimensional poverty is highest for Balochistan, but its contribution to the multidimensional poverty of Pakistan is very low. On the other hand, multidimensional poverty is lowest for Punjab, while its contribution to Pakistan's multidimensional poverty is highest compared to other provinces.

Comparing multidimensional poverty in the housing of rural and urban regions of Pakistan, more than 80% of the households are multidimensionally poor in rural regions, and 38% of the urban regions are multidimensionally poor. The ranking for rural and urban regions of Pakistan is the same for the adjusted multidimensional poverty index. Looking at the contribution of these regions in multidimensional poverty for housing quality in Pakistan, the contribution is highest for rural regions, whereas it is lowest for urban regions. The results reveal that infrastructure development and availability of services in houses are highest for urban regions and lowest for rural regions.

Looking at the contribution of various dimensions in the multidimensional poverty of housing, the structure of the house (inf), along with the

availability of modern energy (ene) and modern communication services (mcs), contributes the highest in the multidimensional poverty. On the other hand, ownership of the house (own) and water for cooking and washing (wcw) contributes less to the multidimensional poverty of housing. The ranking of contributions of these dimensions is the same for all the provinces. This indicates that contributors to multidimensional energy poverty across provinces of Pakistan are more or less the same. Likewise, if we see the contributions of these dimensions in multidimensional poverty of housing for rural and urban regions, the results are the same except for the availability of modern energy resources and ownership of the house. The availability of modern energy resources is better in urban areas than in rural areas. So, this dimension contributes less to adjusted multidimensional housing poverty in urban areas than in rural areas. On the other hand, in rural areas, most households have their own houses. So, this dimension contributes less to adjusted multidimensional housing poverty in rural areas than in urban areas.

In the end, the study presents the results of MPI for housing at district levels. Most of Balochistan and Southern Punjab districts showed a high level of MPI for housing. With the infrastructure development in recent years, Gwadar showed a low level of MPI for housing. Districts of central and upper Punjab and some districts of KPK showed a low level of MPI for housing. Districts of KPK having a border with Afghanistan showed a high level of MPI for housing. The federal capital of Pakistan and all the provincial capitals showed better housing quality standards measured through MPI for housing. Districts with high population share also appeared as high contributors to MPI for housing in Pakistan.

Conclusion:
Improving housing living standards in Pakistan is a complex and multifaceted issue that requires a comprehensive approach. The provision of services by the government, like modern energy resources, water for cleaning and cooking, and modern communication services, add to the quality of housing. The present study highlighted some of the housing

challenges confronted by districts of Pakistan. The study provided an estimate of deficiencies in housing quality through the MPI for housing.

The study concludes that housing conditions in crowded cities of Pakistan are not proper, and there are weak housing policies. Among provinces, Balochistan faced a high level of deficiency in housing quality. As expected, housing quality in rural regions is worse than in urban regions. Further, housing quality is not the same across all the districts of Pakistan, and each dimension contributes differently to MPI for different districts. This indicates that the Pakistan Housing Authority should make policies that can assure the quality of housing in each dimension. Rather than focusing on housing ownership, the authority should also pay attention to the availability of the services like sources of modern energy, water for drinking, washing, and cleaning, toilet facility, garbage collection system, and availability of modern communication systems. The provision of these housing facilities will not only improve living standards but also improve environmental quality and help make economic growth sustainable.

References

Abdul-Rahman, H., Kwan, C.L., & Woods, P.C. (1998). Quality function deployment in construction design: Application in low-cost housing design. *International Journal Quality & Reliability Management*, 16(6), 591–605.

Acolin, A., & Green, R. K. (2017). Measuring housing affordability in São Paulo metropolitan region: Incorporating location. *Cities*, 62, 41-49.

Alkire, S., & Foster, J. (2011). Understandings and misunderstandings of multidimensional poverty measurement. OPHI Working Paper No. 43. Oxford Department of International Development, Queen Elizabeth House (QEH), University of Oxford.

Ashfaq, K. (1974). Housing West Pakistan: 1970-2000. *EKISTICS*, 38(224).

Atkinson, A. (2003). Multidimensional deprivation: Contrasting social welfare and counting approaches, *Journal of Economic Inequality*, 1(1), 51–65.

Bah, E. M., Issa, F. & Geh, Z. F. (2018). *Housing Market Dynamics in Africa*. London: Palgrave Mcmillan.

Bashir, S. A. (2002). Home is where the harm is: Inadequate housing as a public health crisis. *American Journal of Public Health*, 92(5), 733-738.

Bielestein, D. (1973). One World Only: Prospects and Feasibility of Low Cost Housing Activities in Asia. (Report No. 8). Friedrich Ebert Stiftung, Tokyo', Japan.

Bouillon, C. (2012). *Room for Development: Housing Markets in Latin America and the Caribbean*. Washington, DC: Inter-American Development Bank.

Brown, C., Ravallion, M., & van de Walle, D. (2020). *Can the World's Poor Protect themselves from the New Coronavirus?* NBER Working Paper 27200.

Building Research Establishment (2007). *Design Quality Indicators*. London: Building Research Establishment, Her Majesty's Stationery Office.

Cattaneo, M. D., Galiani, S., Gertler, P. K., Martinez, S., & Titiunik, R. (2009). Housing, health, and happiness. *American Economic Journal: Economic Policy*, 1(1), 75-105.

Chhattari, R. S. (1978). Shelter for the shelterless. *Economic Review*, 9(10).

Chohan, A. H., Che-Ani, A. I., Shar, B. K., Awad, J., Jawaid, A., Tawil, N. M. (2015). A model of housing quality determinants (HQD) for affordable housing. *Journal of Construction in Developing Countries,* 20(1), 117-136.

Cowasjee, A. (2004). *Violation of City*. English Daily Dawn, September 12, 2004.

Czeslaw, B., & Leszek, R. (1999). *Podstawy Ekonomiki Konsumpcyjnej*, AE, Kraków, 38-54.

Department of Housing and Urban Development. (2004). *Housing Quality Standards and Inspections*. Washington DC: Department for Housing and Urban Development Housing Quality Standards.

Devoto, M., Bailey, S., Craze, P., & Memmott, J. (2012). Understanding and planning ecological restoration of plant-pollinator networks. *Ecology Letters*, 15, 319-328.

Duflo, E., Greenstone, M., Guiteras, R., & Clasen, T. (2015). *Toilets Can Work: Short and Medium Run Health Impacts of Addressing Complementarities and Externalities in Water and Sanitation*. NBER Working Paper Series.

Evans, G. W. (2006). Child development and the physical environment. *Annual Review of Psychology*, 57, 423-451.

Farooq, H. (1978). How to house the masses. *Economic Review*, 9(10).

Galiani, S., Gertler, P., & Schardrodsky, E. (2005). Water for Life: The impact of the privatization of water services on child mortality. *Journal of Political Economy*, 113(1), 83-120.

Gallup (2021). *Satisfaction with Affordable Housing*. https://news.gallup.com/topic/category_housing.aspx

Goux, D. & Maurin, E. (2005). The effect of overcrowded housing on children's performance at school. *Journal Public Economics*, 89(5-6), 797-819.

Housing Corporation England. (2007). *Design and Quality Standards*. London: Housing Corporation.

Hussain, N. (2007). Affordable housing for masses. *The News,* July 10, 2007.

Ijaz, H., & Rashid, J. (2015). Determinants of the quality of housing in poor and non-poor households. *Gomal University Journal of Research*, 31(2), 87-98.

Irfan, S.D., Faruque, M.O., Islam M.U., Sanjoy, S.S., Afrin, D., & Hossain, A. (2017). Socio demographic determinants of adult tuberculosis: A matched case-control study in Bangladesh. *American Journal of Infectious Diseases*, 13(3), 32-37.

Jalan, J. & Ravallion, M. (2003). Does piped water reduce diarrhea for children in rural India? *Journal of Econometrics*, 112, 153-173.

Jamison, D. T., Mosley, W.H., Measham, A. R., & Bobadilla, J. L. (1993). *Disease Control Priorities in Developing Countries*. Washington, D.C.: The World Bank

Kremer, M., Leino, J., Miguel, E., & Zwane, A. P. (2011). Spring cleaning: Rural water impacts, valuation, and property rights institutions. *The Quarterly Journal of Economics*, 126(1), 145-205.

Krieger, J. & Higgings, D.L. (2002). Housing and health: Time again for public health action. *American Journal of Public Health*, 92(5), 758-768.

Lora, E., Powell, A., van Praag, B. M. S., & Sanguinetti, P. (2010). *The Quality of Life in Latin American Cities. Markets and Perception*. Washington, D.C.: Inter-American Development Bank.

Loring, William C. (1964). Residential environment: Nexus of personal interaction and healthful development. *Journal of Health and Human Behaviour*, 5, 12.

Martin, A.E. (1967). Environment, housing and health. *Urban Studies*. Geneva: WHO/ENV 1967. 13.

Mitchel, R. E. (1971). Some social implications of high density housing. *American Sociological Review*. 36(1),

Nabassaga, T., Bah, E., & Faye, I. (2019). *Quality Homes for Sustainable Malaria Prevention in Africa*, Working Paper Series No. 312. Abidjan, Côte d'Ivoire: African Development Bank.

Saiz, A., Cuéller, A., Rodríguez, L., & Ganitsky, R. (2022). Confronting the housing challenge in Latin America Part I – Reflections on the evolution of the housing market in Latin America: Realities and Dreams, Working Paper 22/11, MIT Center for Real Estate Research.

Sandhu, M. H. (1972). *Low Income Housing in Urban Areas*, Lahore: Punjab Board of Economic Inquiry. (Publication No. 50).

Scotland Housing Quality Standards. (2007). *Scottish Housing Quality Standard Progress Report*. Scotland: Communities Scotland.

Thomson, H., Thomas, S., Sellstrom, E., & Petticrew, M. (2009). The health impacts of housing improvements: A systematic review of intervention studies from 1887 to 2007. *American Journal of Public Health*, 99, 681-692.

Tusting, L.S., Bisanzio, D., Alabaster, G., Cameron, E., Cibulskis, R., Davies, M., Flaxman, S., Gibson, H. S., Knudsen, J., Mbogo, C., Okumu, F. O., Seidlein, L. V., Weiss, D. J., Lindsay, S. W., Gething, P. W., Bhatt, S. (2019). Mapping changes in housing in sub-Saharan Africa from 2000 to 2015. *Nature*, 568, 391–394.

UN-Habitat. (2007). *Twenty First Session of Governing Council*. Nairobi, Kenya: United Nations-Habitat.

UN-Habitat (2016). *Habitat III Policy Paper 10 – Housing Policies*,

UN-Habitat and UN-OHCHR. (2019). *Right to Adequate Housing*. UN-Habitat.

World Bank (2020). Approaches to Measuring Housing Deficits: Key Findings and Recommendations for the World Bank Group. Unpublished Manuscript. Washington D.C.: The World Bank.

World Bank (2021). *Fintech Around the World: Patterns of Activity and Enabling Factors*. Unpublished Working Paper.

World Bank, Programma Global de Vivienda Resiliente, GFDRR (2021). La Vivienda en Peru. Un instrumento para la recuperación económica inclusiva y resiliente. Washington D.C.: The World Bank.

World Health Organisation (1987) Housing: The Implications for Health World Health Organisation, Geneva.

Zaki, M. J. A. (1981). Housing conditions in Pakistan: 1960-80. *The Pakistan Development Review*, 20(2), 215-246.

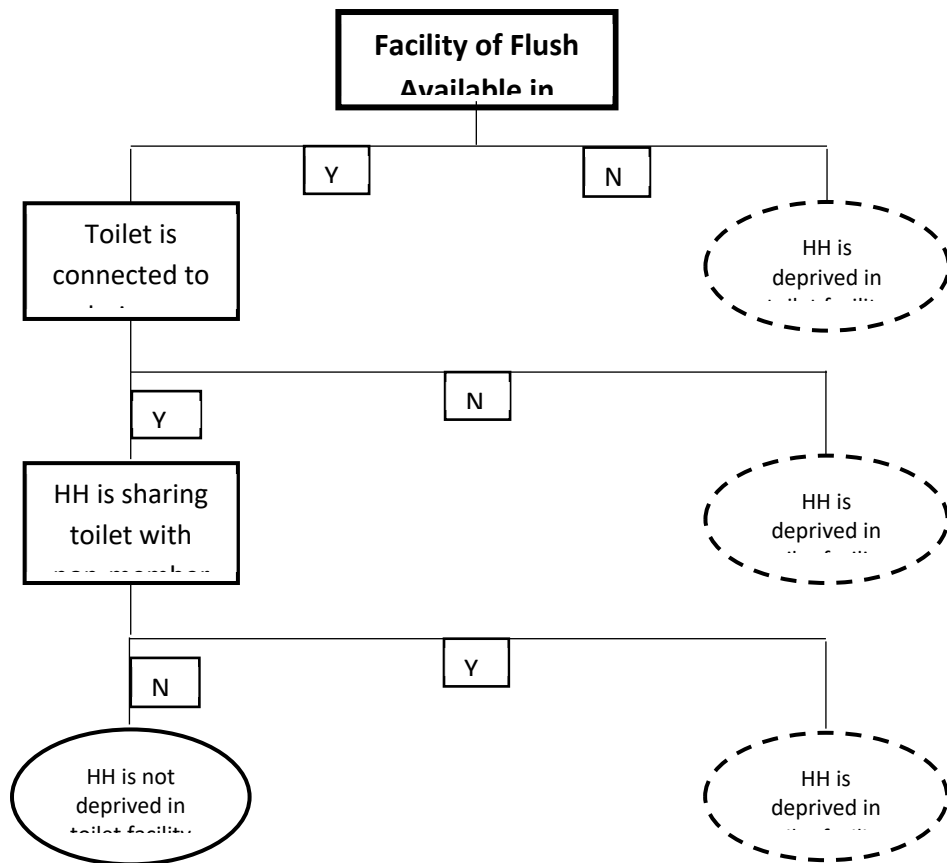**Figure 1: Deprivation in Toilet Facility**

Figure 2: Deprivation in Drinking Water Facility

```
                    ┌─────────────────────────┐
                    │  Availability of Drinking│
                    │      Water at Home       │
                    └─────────────────────────┘
            ┌──────────Yes──────────┬──────────No──────────┐

┌─────────────────────┐                         ┌─────────────────────┐
│   Sufficient water  │                         │   Sufficient water  │
│   available when    │                         │   available when    │
│      required       │                         │      required       │
└─────────────────────┘                         └─────────────────────┘
     │Yes        │No                                 │No         │Yes

(HH is not deprived   (HH is deprived in        (HH is deprived in    ┌─────────────────────┐
 in drinking water     drinking water            drinking water       │ Short Time required │
 availability)         availability)             availability)        │ to get the water from│
                                                                       │    outside home      │
                                                                       └─────────────────────┘
          │No                                                                │Yes

  (HH is deprived in                                              ┌─────────────────────┐
   drinking water                                                 │ Small distance      │
   availability)                                                  │ required to cover to│
                                                                  │ get the drinking    │
                                                                  │ water               │
                                                                  └─────────────────────┘
          │No                                                                │Yes

  (HH is deprived in                                              (HH is not deprived
   drinking water                                                  in drinking water
   availability)                                                   availability)
```
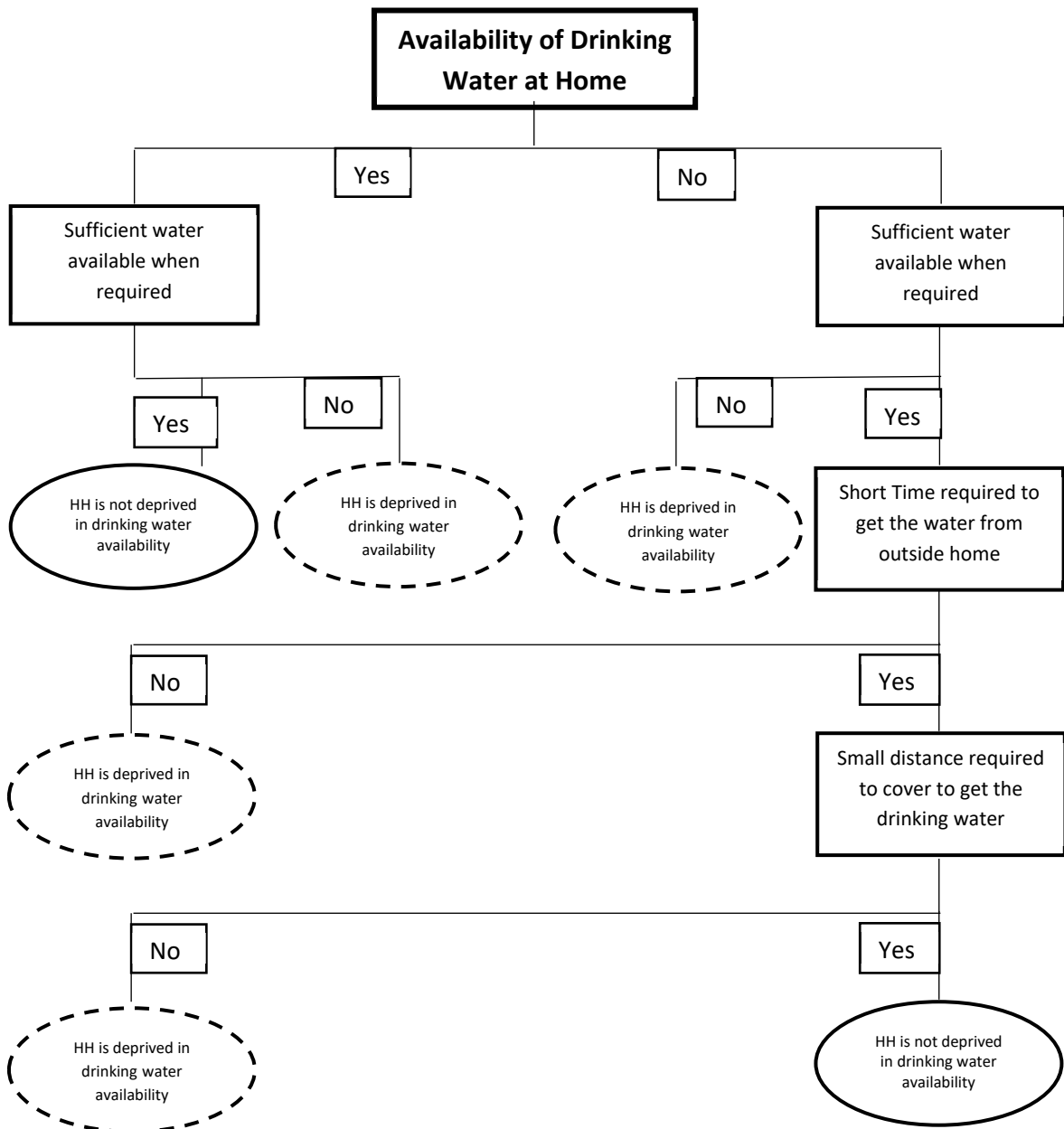
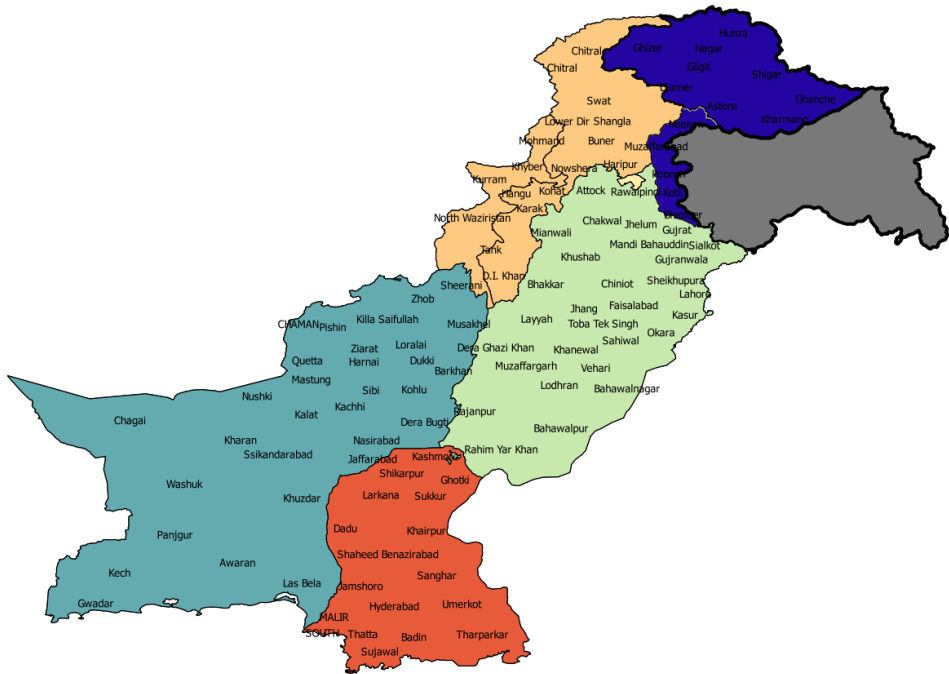**Figure 3: Boundaries of Districts and Provinces of Pakistan**

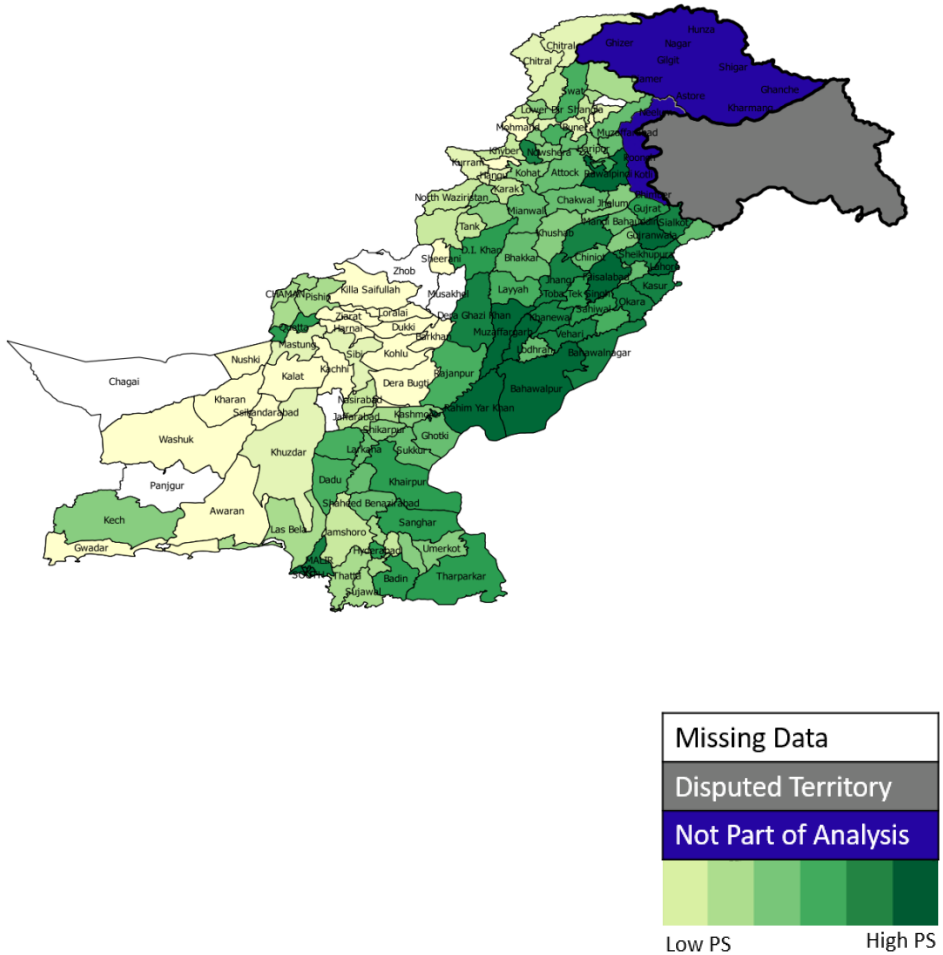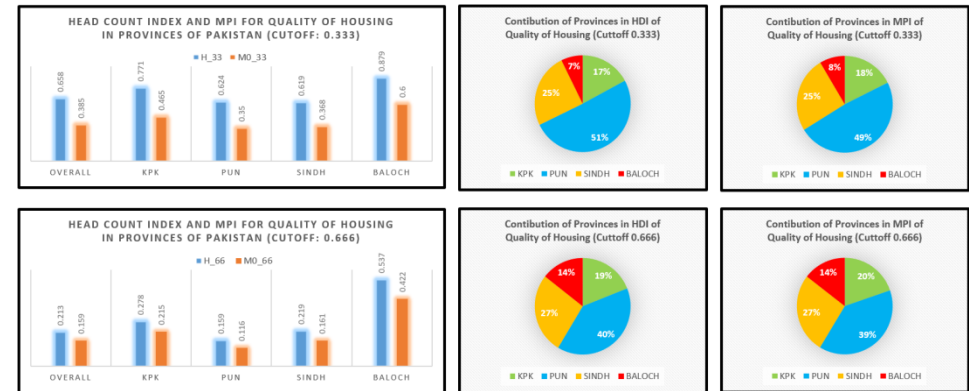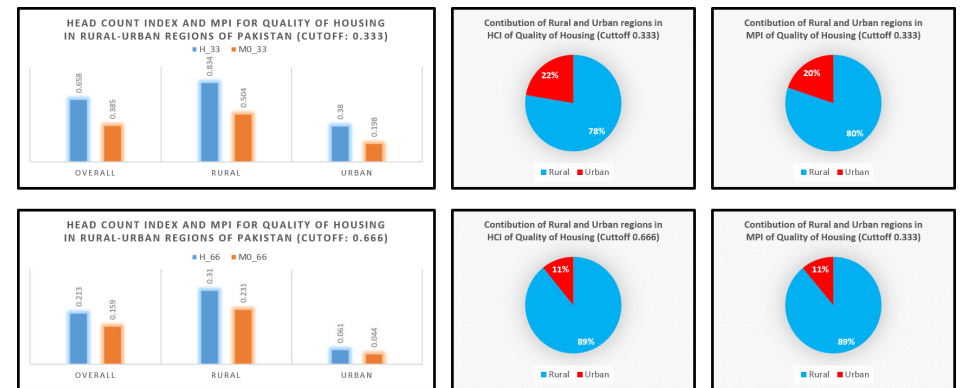**Figure 4: Population Share (PS) of Districts of Pakistan**

Figure 4: MPI for quality of housing for Pakistan and its provinces

Figure 5: MPI for Quality of Housing for Pakistan and its rural-urban regions

Figure 6: Contribution to MPI for Quality of Housing by each dimension
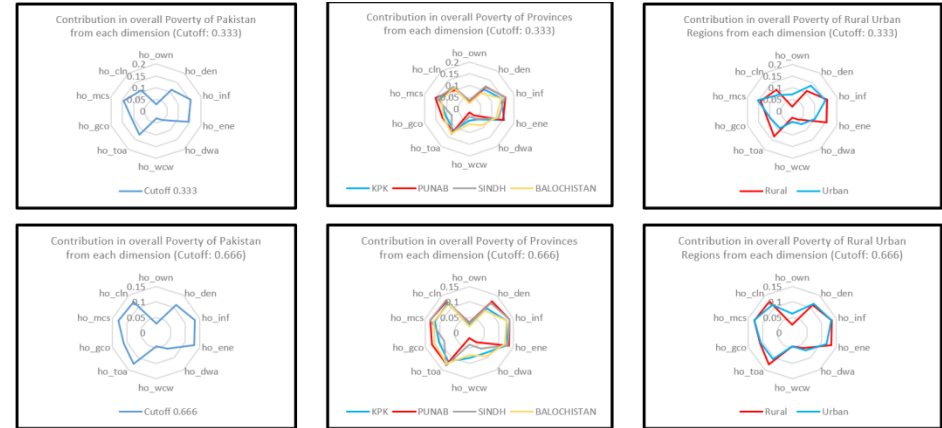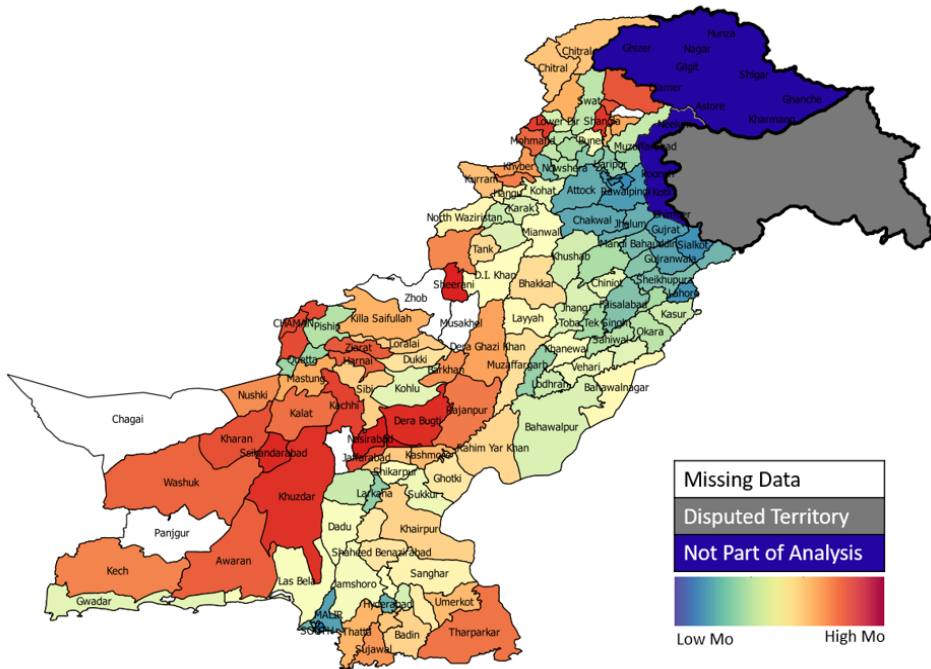
Figure 7: MPI for Quality of Housing for Districts of Pakistan using cutoffs 33.33%

MPI for Quality Housing for Districts of Pakistan (Cutoff: 0.333)

*Professor of Economics, Ghulam Ishaq Khan Memorial Chair (SBP), Kashmir Institute of Economics, The University of Azad Jammu & Kashmir, Muzaffarabad. email: m.jamil@ajku.edu.pk

Contribution of Districts in MPI for quality of housing (k=0.333)
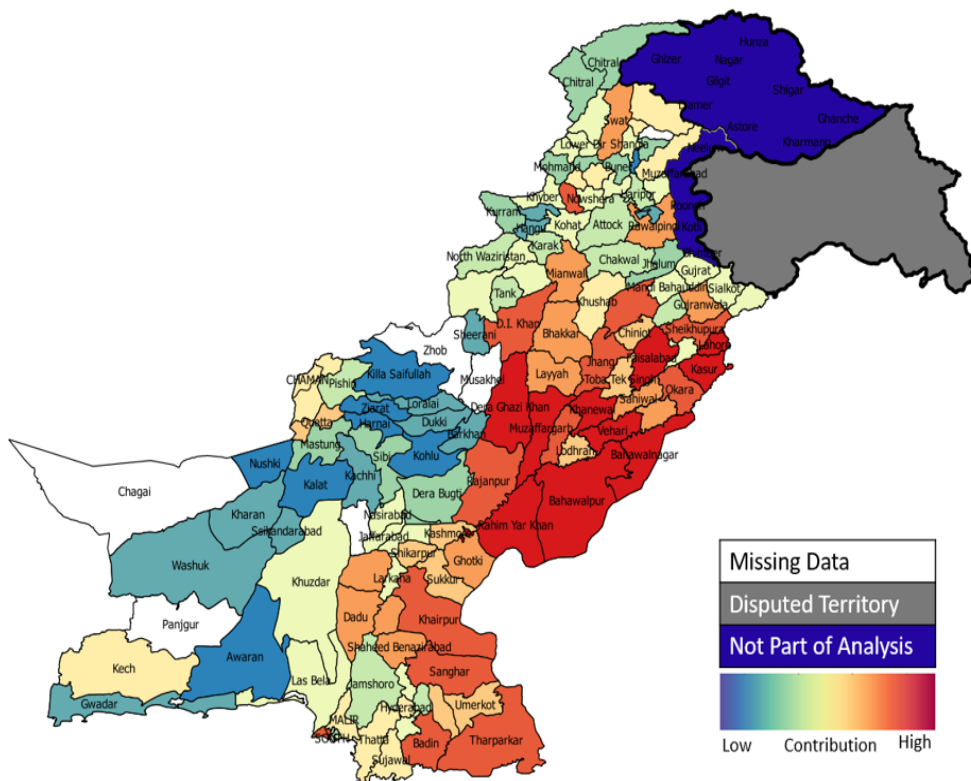
Appendix A: List of Districts

1	Islamabad				
Punjab					
2	Attock	14	Sialkot	26	Vehari
3	Rawalpindi	15	Gujranwala	27	Sahiwal
4	Jhelum	16	Sheikhupura	28	Bahawalnagar
5	Chakwal	17	Lahore	29	Bahawalpur
6	Gujrat	18	Kasur	30	Rahim Yar Khan
7	Mianwali	19	Okara	31	Pakpattan
8	Bhakar	20	Rajanpur	32	Narowal
9	Sargodha	21	Dera Ghazi Khan	33	Lodhran
10	Khushab	22	Layyah	34	Mandi Bahauddin
11	Faisalabad	23	Muzaffargarh	35	Hafizabad

12	Toba Tek Singh	24	Multan	36	Nankana Sahib
13	Jhang	25	Khanewal	37	Chiniot
	Sindh				
38	Jacobabad	46	Badin	54	Kambar
39	Sukkur	47	Sanghar	55	Jamshoro
40	Shikarpur	48	Tharparkar	56	Kashmore
41	Larkana	49	Thatta	57	Matiari
42	Shaheed Benazirabad	50	Naushahro Feroze	58	Tando Allah Yar
43	Khairpur	51	Mirpur Khas	59	Tando Muhammad Khan
44	Dadu	52	Ghotki	60	Sujawal
45	Hyderabad	53	Umerkot	61	Karachi (Central)
	Khyber Pakhtunkhwa				
62	Chitral	71	Kohat	80	Lakki Marwat
63	Lower Dir	72	Karak	81	Tank
64	Swat	73	Bannu	82	Batagram
65	Malakand	74	Dera Ismail Khan	83	Shangla
66	Kohistan	75	Nowshera	84	Hangu
67	Mansehra	76	Charsadda	85	Upper Dir
68	Abbottabad	77	Swabi	86	Tor Ghar
69	Mardan	78	Haripur		
70	Peshawar	79	Buner		
	Balochistan				
87	Quetta	97	Khuzdar	107	Dera Bugti
88	Pishin	98	Kharan	108	Mastung
89	Loralai	99	Lasbela	109	Awaran
90	Zhob	100	Gwadar	110	Ziarat
91	Chagai	101	Panjgur	111	Sharani
92	Sibi	102	Jhal Magsi	112	Jaffarabad
93	Nasirabad	103	Killa Saifullah	113	Kech
94	Bolan	104	Killa Abdullah	114	Harnai
95	Kohlu	105	Musakhel	115	Washuk
96	Kalat	106	Barkhan	116	Noshki

*Corresponding Author, Department of Accounting & Finance, Kinnaird College for Women,
Naila.sadiq@kinnaird.edu.pk
**Department of Accounting & Finance, Kinnaird College for Women
***Department of Accounting & Finance, Kinnaird College for Women

Intellectual Capital in Action: Unleashing Sustainable Growth in Non-Financial Companies of Pakistan

*Naila Sadiq,** Laiba Khawaja & ***Syeda Fizza Abbas

Abstract: In contemporary competitive markets, firms must have sustainable profits and potential for long-term growth. This research focuses on how intellectual capital efficiency can assist in attaining sustainable growth rate of firms. The research develops a theoretical model that connects components of intellectual capital such as Human, Structural, Relational, Process, and employed capital for corporate sustainable growth in Pakistan's non-financial firms. Six years data of non-financial firms of KSE-100 from the period 2015 to 2020 was collected. Fixed effects panel data regression was used for the testing. The findings of regression output showed strong evidence that two of the intellectual capital components, the Human capital, and Process capital along with basic capital employed measures significantly resulting in the ability to grow sustainably of corporations. However, the results suggested that relational capital is having a weak link with corporate sustainable growth which highlights the doubt that whether Pakistani firms are contributing sufficiently toward the customer, supplier relationships, and marketing. Structural capital is also having a very weak connection with sustainable growth rate. The study conducted adds to the existing literature on intellectual capital and corporate sustainable growth by utilizing more components of IC in the context of Pakistan, a developing economy. Keywords: Intellectual capital efficiency, Corporate sustainable growth, non-financial firms, Human capital, Process capital

1. Introduction

The creation of knowledge is the outcome of increased investment and prominence in science, research, technology, and innovation, as well as the use of computers and the internet to develop, share, and apply knowledge in an increasingly competitive world (Si et al., 2020). Pakistan's innovation and intellectual capital usage abilities are lacking in comparison to other emerging countries, necessitating Pakistani businesses to constantly access the capability of intellectual capital by innovating products, processes, and

management systems. (Fan & Hossain, 2018)Comparing Pakistan's ability to innovate and utilize intellectual capital with its neighbors indicates varied degrees of development. In terms of global innovation indexes, India, Pakistan's closest neighbor, scores higher and has a booming IT sector. Another massive neighbor, China, has made significant investments in R&D, emerging as a global leader in a number of technological fields. Moreover, another neighboring country Iran has made major strides in science and technology (Asiaei, Barani, Bontis, & Arabahmadi, 2020). Despite not being a close neighbor, Bangladesh has made progress in industries like textiles and agriculture (Dhar, Mutalib, & Subhani, 2019).

The way of accomplishing long-term growth determines a company's dynamic trend of development, which not only represents the company's survival and development capacity but also influences its future financial performance. Therefore, in contemporary competitive markets, it is required of firms to have sustainable profits and potential long-term growth (Xu & Wang, 2018). Therefore, to maintain sustainable growth firms should not only focus on the capital employed but also on intellectual capital which is quickly becoming the new norm of dynamic capability. The balance sheet of a company may be used to evaluate all a firm's physical assets.[i]

Rashid et al. (2018) found IC is critical for companies since their human capital (workers) is well-versed with the company, its procedures, their jobs, and the many internal and external circumstances in which the business finds itself. Present knowledge serves as a foundation for future information and capturing and sharing existing workers' knowledge with new hires is a cumulative process for growing the IC base. The assessment of corporate sustainable boom no longer only reflects the historic overall performance of establishments but additionally are expecting the income enlargement of firms within the future. If businesses want to own an efficient performance of sustainable boom, they need to make use of intangible sources (intellectual capital) to hold aggressive gain, and alter the funding in intellectual capital with dynamic adjustments of the internal and external running surroundings (Si et al., 2020).

The past literature has provided some effective models for measuring intellectual capital. For example, (Pulic) has proposed a model in 1998

referred to as the value-added intellectual-coefficient model denoted as (VAIC). It comprises two elements known as capital employed efficiency (CEE) and intellectual capital efficiency (ICE). The efficiency of potential resources of the company concerning value creation is determined by the VAIC framework (Khalique et al., 2019). This framework applies a definite process for the computation of the required coefficients and has commonly been seen in the past literature. However, this model has always been criticised by the previous scholars, for example, the greatest criticism reported for the VAIC model is that the model does not focus on the role served by external relational capital in value creation for the companies (Poh et al., 2018; RASHID et al., 2020)

Ulum and Syam (2017) have modified this model to overcome the issues in their existing model. This framework involves relational capital as a vital tool in creating value for companies (Tarigan et al., 2019). Structural capital in this model is also focused as an individual part of intellectual capital that does not base on human capital (Sharma et al., 2017). Hence, this modified model overcame the deficiencies of the previous VAIC model emphasizing the components that were avoided by the past model. With every passing day, upgrades in technology are forcing firms to work harder towards gaining or continuing to achieve a competitive advantage. It has now become insufficient for an enterprise to assess its performance based on only short-term financial measures. It is inevitable now to be able to evaluate a firm's long-term development potential and operational prospects.

Only constant innovation is a way for a company to maintain its exuberance and competitive advantage. Without this innovation factor, an enterprise puts itself at risk of becoming obsolete. Therefore, this sustainable growth or value-creating continuity can be achieved through investments in intangible resources known as intellectual capital to meet effective alterations in internal and external operational conditions.

This study is hoped to assist in identifying if a notable relationship between the efficiency of IC of a firm and its sustainable growth within the non-financial companies exists or not. In developing countries like Pakistan, corporate growth management is a major challenge for a firm's management in today's competitive business environment. The goal of this

study is to determine the empirical link between intellectual capital efficiency and corporate sustainable growth in Pakistani enterprises to examine the impact of human capital, relational capital, structural capital, and process capital on corporate sustainable growth rates.

Chief research questions of the study devised are given below.

- Is there a significant link between M-VAIC and CSG?
- Is there a significant link between the human capital, structural capital, Relational capital, Process capital, and CSG?

2. Theoretical Background

The concept of intellectual capital has developed from the strategic management perspectives such as the resource-based view, which is related to internal resources, and the knowledge-based view which focuses on knowledge (Ulum & Syam, 2017). Before the origin of the resource-based view, it was considered by the professionals that a company can achieve its competitive advantage by bringing changes as per the dynamic changes in the environment within which the organizations are operating respectively (Emadzadeh et al., 2013). This view was previously referred to as the industrial-organizational view. In contrast, the resource-based view is a modern view that is focused on the internal resources being scarce, inimitable, and rare (Xu & Wang, 2018). The notion of the resource-based view was that a company can achieve its competitive advantage over others if its internal resources are managed effectively. Tarigan et al. (2019) noted that the resource-based view does not associate with the establishment of human resources in order to create a competitive margin. Mohammadi et al. (2014) added that this is more rigid since this is more necessary in changes related to the environment. Furthermore, a resource-based view could not extensively focus on intellectual capital and knowledge, instead, it considers it as a generic type of source (Sharma et al., 2017).

To deal with the shortcomings of the resource-based view, another key concept is developed that is referred to as the knowledge-based view which sees knowledge as a key resource for creating a competitive advantage. Poh et al. (2018) mentioned that the knowledge-based view suggests that the right management of knowledge builds intellectual capital that is significant for the company. In relation to it, this is noted that a company can create a

competitive advantage when its knowledge and intellectual capital are managed effectively. Since every organization competes to maximize its revenues by using its resources in an appropriate manner. The resource-based view suggests that the companies view their resources on the basis of tangible and intangible assets in order to gain a competitive advantage. Provided with the scarcity related to tangible resources, RASHID et al. (2020) stated that achieving competitive advantage among others needs extensive focus on intangible resources. Another theory that supports the importance of intellectual capital is stakeholder theory. This theory suggests that it is not only mandatory for a firm to oblige the immediate shareholders only, rather it is accountable for any group or individual who is affected or can impact the enterprise e-g customers, suppliers, communities or environment as a whole etc. (Kamath, 2014).

Insert Figure 1

3. Literature Review

3.1 Concept of Intellectual capital

A generally approved explanation of intellectual capital is complex to state and it becomes even more challenging to represent a typically implemented typology for intellectual capital due to the fact that this notion is still in the emerging stage of its development (Kwarbai & Akinpelu, 2016). Basically, intellectual consists of the funds or stocks of knowledge, competencies, intangible capabilities, resources, and assets that allow the basic business processes development within the organisation (ul Rehman & Jalil, 2021; Yaseen et al., 2016).

Competitive advantage can be attained in a highly dynamic and competitive business market by incorporating Intellectual capital. Thus, many researchers have conceptualised and suggested that the aim of intellectual capital is to create value for the business (Smriti & Das, 2017). The general components of intellectual capital include structural, relational, and human capitals. Within this model, human capital is related to the individual competencies and knowledge stock in relation to the company delegated by the employees working in it, relational capital notifies the link among external and internal stakeholders (Avci & Nassar, 2017).

S Mohammad (2021) highlighted that structural capital shows the skills underlined in the business operations. Morris (2015) mentioned that a high focus is given on the knowledge and skills of employees instead of the physical or tangible resources of the organization. It is due to the fact that employee skills, competencies, intellect, and individual knowledge would determine the way company's physical resources can be used effectively in order to attain company goals. It is also supported by (Avci & Nassar, 2017) that the employee's own skills and knowledge are the key source to create value. Therefore, it can be evaluated that cost on employees can be considered as investments instead of cost as it increases and sustain business value in the long-run.

3.2 Components of Modified-VAIC^{TM}

 Modified intellectual capital is fundamentally based on three key components that are structural capital, relational capital, and human capital (Poh et al., 2018). According to Tarigan et al. (2019), human capital mainly links to experience, knowledge, intellectual agility, qualification, proactivity, intuition, innovative style, skills, and capabilities of the employees. Sharma et al. (2017) reviewed it as a multidimensional process, which might involve constructive habit development, education, health, the advantage of more social interaction, and training.

The sphere of knowledge of a firm might be expanded with fewer efforts through effective social interaction. Preserving human capital is generally a difficult task for an organisation as the workforce's knowledge, skills, and competencies go with them when they leave an organisation (Hifza et al., 2020; Ulum & Syam, 2017).This can be analysed that human capital serves as a substantial component of intellectual capital and supports the

organisation in strategic development and innovation that indicates its significance in business productivity (Xu & Wang, 2018). However, Mohammadi et al. (2014)suggest that companies might attempt to preserve the human capital by providing vocational benefits, bonuses, and lucrative salaries. In the context of Pakistan, the country is positioned at 152 among 189 countries as per the human development index with a 0.56 value that comes at a lower level (UNDP, 2019). This data reflects the low-level investment in the human capital component of Pakistan that is one of the significant components of intellectual capital as discussed above.

According to De Luca et al. (2020) structural capital comprises of innovation capital and process capital. The process comprises of techniques, equipment, and systems of the company (Emadzadeh et al., 2013). Sharma et al. (2017) highlighted that overall structural capital can be secured by different strategies for example trade secrets, patent registrations, brands, trademarks, and copyrights. Besides that, relational capital links to the competencies and knowledge achieved by interconnection not just with customers yet also the other stakeholders such as the government, partners, competitors, and suppliers of the organisation (RASHID et al., 2020). Relational capital comprises external and customer capital (Hifza et al., 2020).Customer capital is dependent on the way organisation deals with relations by satisfying the demands of the customers (Mukherjee & Sen, 2019).

Another necessary element is capital employed that has been researched with respect to the financial capabilities of the companies as the literature shows capital employee, also denoted as CE can be explained as a book value allocated to average company assets (Xu & Wang, 2018). There is another concept of capital employed efficiency that is defined by the value created by the capital employed. All these capitals used by the organisations eventually working towards the overall business performance through their appropriate allocation that enable sustainable business growth (Xu et al., 2021a).

3.3 Corporate sustainable growth

The concept of sustainable organisational growth has a multifaceted meaning and use. Though, from a financial view, sustainable business growth means steady and persistent development, which can be sustained

in terms of profits for future growth and development (Tarigan et al., 2019). Corporate sustainability initially gained importance by the theory proposed by Higgins in which the utilisation of sustainable development rate model was examined in defining practical strength for new businesses (Fonseka et al., 2012). The notion of corporate sustainable development rate expresses which sales growth is persistent with the ground realities of the organisation and about its financial market position (Nguyen, 2016).

In particular, the rate of corporate sustainable aims to define the highest level of yearly growth and development in terms of sales percentage that an organisation can endure without allocating any other equity or reformulating its financial guidelines. Past studies such (Khalique et al., 2019; Ozkan et al., 2017; Poh et al., 2018) indicated that the intellectual capital of a company has a positive impact on its sustainable competitive advantages. The importance of the company's intellectual components has been identified as the key actors in attaining a sustainable competitive margin and serve as major elements for business performance and value creation of an advanced knowledge-based economy. Moreover, this might also validate the reason for market return to be greater than the book value (Tarigan et al., 2019).

Organisations are experiencing challenges to sustain competitiveness, survival, and growth in the market as they are mostly based on their employee skills and competencies for new ideas and innovation to build a competitive advantage for the company (Setyawati et al., 2019). It is possibly dealt with by the concept of intellectual capital that companies achieve sustainable competitive advantage by implementing four key attributes as proposed by Barney in 1991 including value, rarity, imitability, and organisational support particularly in the dynamic knowledge-based economy (Hifza et al., 2020). Hence, this is considered potentially as the knowledge resources, which organisations use as a key component of their competitive factor to add value in the specified market. Competitive advantage, in the long run, exists as the competitors are incapable of adopting or formulating the strategies to create business value on the basis of the four major attributes of this resource-based model. Thus, it can be evaluated that a company can create a resilient and sustainable market position by considering these four attributes and increase its organisational survival through sustainable growth (Pal & Soriya, 2012).

Different researches have been performed to evaluate the relationship of intellectual capital with organizational performance and productivity through the lens of financial aspects using secondary and primary sources. A study conducted by Mohammadi et al. (2014) examined different aspects regarding intellectual capital and their connection to the financial condition of the company. In this research, the authors have taken 14 different latent variables and data was collected by survey questionnaire administered to 79 participants. The findings of the study showed that relational capital has a high impact on the company's financial performance, which is followed by the strong impact of the other two components that are structural and human capital.

Another research conducted by Emadzadeh et al. (2013) applied the balanced scorecard method to measure intellectual capital and its significance in the firm performance. The results of this study gave an idea that intellectual had a significant impact on sustainable corporate performance. Furthermore, intellectual capital was also seen to influence internal growth, learning, customers, and processes. In addition to it, few research scholars have collected secondary data for measuring intellectual capital for example (Fijałkowska, 2014; Pal & Soriya, 2012). These research studies are conducted in both financial and non-financial companies. For instance, Ulum and Syam (2017) determined the relationship between intellectual capital and organizational financial performance of the banking sector in Indonesia. The quantitative analysis of intellectual capital was performed by using the VAIC framework. The results showed a positive and moderate relationship between intellectual capital and banking performance. Moreover, the author has used a survey questionnaire as a research instrument in order to collect primary data from the professionals working in the banking sector, which was then compared and contrasted with the VAIC model. The findings of this research indicated that the application of the VAIC framework provided a much stronger impact of intellectual capital on companies' financial performance as compared to the survey method.

Similarly, another study conducted by Mukherjee and Sen (2019) in India based on analyzing the effect of intellectual capital and the related components on sustainable development of the Indian companies. Moreover, the author also focused on examining the highest influential

intellectual capital component that has a greater impact on sustainable growth as compared to others. The results of this research were also based on measuring intellectual capital by using a modified version of the VAIC model that indicated a positive effect on firms' sustainable growth. Notably, the findings of this research also demonstrate that every explanatory variable including process capital, innovation capital, relational capital, and physical capital give a significant impact in explaining sustainable corporate growth.

Apart from it, some other significant literature studies have shown a notable relationship between the organisational intellectual capital and its performance. For example, Asiaei and Jusoh (2015) aims to view intellectual capital through a multi-dimensional view and its effect on business performance. The authors found that business culture serves a key role in building structural and human capital, however, trust is also a key factor among the different other intellectual capital. Similarly, Sarwar et al. (2016) also examined the role of human capital and practices in the performance of construction firms of Pakistan in which the authors noted that human capital along with human resource practices increase overall company performance. In the similar context, Tran and Vo (2020) explored the links between efficiencies of human capital and organisational performance over different industries in the potential emerging market. The results of this study showed that banking industry does not possess the greater human capital level accumulation as indicated previously.

4. Research Methodology

Annual financial reports of non-financial companies (KSE-100 index) were used to extract secondary data. For this purpose, companies' annual reports were downloaded from their official websites as well as PSX data portal was utilized. Data collected comprised of a six-year period from 2015 to 2020. After excluding financial firms and firms with insufficient data, final sample is based on 72 companies and 432 observations of a balanced panel data was collected. The analysis is performed through Stata14 and SPSS software. Pooled Ordinary Least Square (OLS) regression model is used to depicts the variables used in this study as this methodology is more appropriate to determine the impact of intellectual capital efficiency on corporate sustainability Tran and Vo (2020).

Insert Figure 2

4.2 Hypothesis Formulation

1. Ho_1: M-VAIC has no significant effect on CSG.

   H_1: M-VAIC has a significant effect on CSG.

2. Ho_2: Capital employed efficiency has no significant effect on CSG.

   H_2: Capital employed efficiency has a significant effect on CSG.

3. Ho_3: Human capital has no significant effect on CSG.

   H_3: Human capital has significant effect on CSG.

4. Ho_4: Structural capital has no significant effect on CSG.

   H_4: Structural capital has significant effect on CSG.

5. Ho_5: Relational Capital has no significant effect on CSG.

   H_5: Relational Capital has significant effect on CSG.

6. Ho_6: There is a significant effect of Process Capital on CSG.

   H_6: There is no significant effect of Process Capital on CSG.

4.3 Operationalization
4.3.1 Dependent Variable

Corporate sustainable growth will be our dependent variable in this respective study. Corporate sustainability may be measured in a variety of

ways. Though Van Horne and Higgins' sustainable growth rate model is generally recognized and utilized in the previous researches(Xu & Wang, 2018) . This study will be employing Van Horne and Wachowicsz 's steady state model. The equation will be as follows;

$$SGR_{i,t} = \frac{(P \times A \times T \times R)_{i,t}}{(1 - P \times A \times T \times R)_{i,t}} \qquad (1)$$

where SGR is corporate sustainable growth, $_{i,t}$ are company and year, P is profit margin, A is equal to asset turnover ratio , T is equity multiplier and R is retention rate (Xu et al., 2021b).

4.3.2 Independent Variables

In this study, Modified-VAIC as a whole (comprising of Capital Employed efficiency plus Intellectual capital efficiency) and Individual components of ICE which are HCE, SCE, RCE, and PCE are the independent variables. VAIC is produced from accounting data relating to financial statements such as the company's balance sheet and the statement of income. VA (Value Added) is the value created by the firm's resources and can computed as follows (Nimtrakoon, 2015).

$$VA_{i,t} = OUT_{i,t} - IN_{i,t} \qquad (2)$$

Here OUT is the total revenue created by a specific firm in year t. IN refers to all the expense cost occurred to create the revenue minus the employee expense.

Moreover, the equation for our model will be;

$$M - VAIC_{i,t} = CEE_{i,t} + ICE_{i,t} \qquad (3)$$

$$CEE_{i,t} = \frac{VA_{i,t}}{CE_{i,t}} \qquad (4)$$

Equation 4 shows the Capital employed efficiency. $CE_{i,t}$ represents the Capital Employed by a certain business at the conclusion of t periods (i.e., Total Assets less Current Liabilities).

$$ICE_{i,t} = HCE_{i,t} + SCE_{i,t} + RCE_{i,t} + +PCE_{i,t} \qquad (5)$$

$$HCE_{i,t} = \frac{VA_{i,t}}{HC_{i,t}} \qquad (6)$$

Where $HC_{i,t}$ are employee benefit expenses in year t.

$$SCE_{i,t} = \frac{SC_{i,t}}{VA_{i,t}} \qquad (7)$$

Structural capital (SC) is what's left over after subtracting VA and HC in Pulic's model. As HC's creating value increases, so, SC's generation value declines.

$$RCE_{i,t} = \frac{RC_{i,t}}{VA_{i,t}} \qquad (8)$$

Sales expenditures serve as a proxy for relational capital, or RC for short.

$$PCE_{i,t} = SCE_{i,t} - RCE_{i,t} \qquad (9)$$

SCE is the Structural Capital Efficiency (i.e., SC / VA; where SC = VA-C) and PCE is the Process Capital Efficiency.

4.3.3 Control Variables

This study, following previous researches uses the natural logarithm of total assets as a control variable for enterprise size, using the following calculation:

$$SIZE_{i,t} = ln(Total\ assets) \qquad\qquad (10)$$

Leverage (LEV) variance will have a significant impact on a company's success. So, leverage will be used as a control variable in this investigation.

4.4 Econometric Equations

$$SGR_{i,t} = \beta_1 + \beta_2 MVAIC_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 LEV_{i,t} + \varepsilon_{i,t} \qquad \text{(Model 1)}$$

$$SGR_{i,t} = \beta_1 + \beta_2 CEE_{i,t} + \beta_3 HCE_{i,t} + \beta_4 SCE_{i,t} + \beta_5 RCE_{i,t} + \beta_6 PCE_{i,t} + \beta_7 SIZE_{i,t}$$

$$+\beta_8 LEV_{i,t} + \varepsilon_{i,t} \qquad\qquad \text{(Model 2)}$$

Model (1) investigates the influence on corporate sustainable growth (SGR) of Modified- VAIC as a whole whereas Model (2) further explores the particular impact on corporate sustainable growth of intellectual capital components.

5. Results
5.1 Descriptive Statistics

Insert Table 1

The table above presents descriptive statistics of selected variables employed in the research. Sustainable Growth rate has a mean value of 24% in non-financial firms of KSE-100 index. M-VAIC has a mean value of 5.452, a maximum of 38.806 and a low of -46.182. The negative M-VAIC score indicates that the investment in processing Intellectual capital is more than its contribution to the firm's value generation process. The mean value of HCE, 4.034, is greater than the other IC components, implying that HCE is the primary driver of creating value among the IC components. It's worth noticing that PCE has the lowest mean value of the IC components, at 0.2, implying that it doesn't contribute to

the firm's value creation process. LEV has a mean score of 0.53, indicating that non-financial enterprises in Pakistan have a low-geared capital structure. Furthermore, the average SIZE value is 17.415, implying that non-financial enterprises in Pakistan are well-established and evolved on average.

The length or lack of symmetry within the distribution pattern is being represented by the skewness value while the distribution curve's peak or height is displayed by the kurtosis value. In the ideal instance, the skewness and kurtosis value shall be zero of a bell-shaped curve. SGR, HCE, RCE, SIZE, and LEV all depict skewness values greater than zero, suggesting positively skewed distributions, but M-VAIC, CEE, SCE, and PCE are showing skewness values < zero, indicating negatively skewed distributions. On the other hand, all of the variables have kurtosis values more than zero, indicating that these are significantly peaked, with more data values concentrated near distribution center.

5.2 Correlation Analysis

Insert Table 2

For the purpose of determining link between two variables, correlation analysis is a statistical method used in research. This analysis aids in comprehending the strength of the linear relationship. Coefficients of Correlation range between -1 and 1. Two variables tend to move in tandem when a positive correlation coefficient exists. A positive correlation coefficient indicates that the two variables tend to move in tandem. The greater the coefficient, the more powerful the relationship, while a negative correlation coefficient suggests that they tend to move in opposite directions: observations with high values for one variable are likely to have low values for the other.

The results show that the explanatory variable M-VAIC is having positive relationship with the dependent variable SGR with a coefficient value of 0.139. the relationship of HCE and PCE with dependent variable is also positive which may imply that by increasing investment in human capital and process capital, a firm's sustainable growth rate may show positive

results. The correlation coefficient of CEE (-0.043) shows that there is negative and weak relationship with the dependent variable. The negative sign may indicate that increase in SGR may not always mean that it is attributable to the physical capital employed in a firm, it can be due to other factors. Finally, we need to keep in mind that correlation does not suggest causality.

Prior to running regression tests or making assumptions, it is expected that the data obtained would follow a normal distribution and as a result, before estimating anything, the data will be normalized so that statistical techniques can be applied to it (Tsagris & Pandis, 2021).

5.3 Normality Assumption:

Normality is a powerful assumption that implies some interesting theoretical properties. In normality assumption it has to be assured that the dependent variable follows a normal distribution or approximately follows. Initially outliers were detected in the data after plotting graph plot of the dependent variable. The graph box showed that dependent variable was not normally distributed which was not a representative of the naturally occurring phenomenon. A simple outlier removal and squared transformation on the dependent variable of SGR had been conducted. After taking the square of SGR, the graph plots were rerun on the newly generated variable, and it was found out that the dependent variable were still non-normal. Therefore, to reach this assumption, rank transforms were applied which are another type of transform. Following this procedure, different normality tests like histograms, Shapiro wilk and Jarque Bera tests were conducted, and it was found that the dependent variable was approximately normally distributed. The variable was then used for further Panel data regression. It is evident from the results given below.
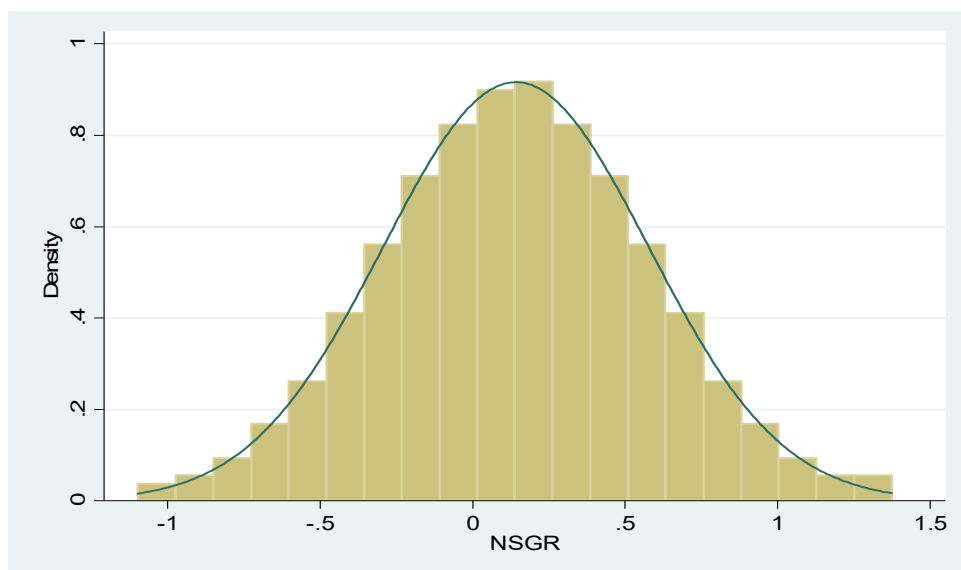
Figure 3, Histogram plot-NSGR

Figure 4, Shapiro wilk & SK test

5.4 Multicollinearity Assumption:

According to Giacalone, Panarello, and Mattera (2018) Multicollinearity isn't just present or missing; it's also important to assess its severity, which ranges from no collinearity to perfect collinearity. In real data, some level of multicollinearity is almost always present. Moreover, Multicollinearity can cause a variety of problems, including estimation problems, forecasting problems, and interpretation problems.

```
. vif
```

Variable	VIF	1/VIF
SIZE	1.03	0.972099
MVAIC	1.03	0.974939
LEV	1.00	0.996728
Mean VIF	1.02	

Figure 5, Variance inflation factor, Model 1

```
. vif
```

Variable	VIF	1/VIF
SCE	1.37	0.731920
RCE	1.33	0.753784
PCE	1.23	0.811960
HCE	1.12	0.894667
SIZE	1.07	0.934195
CEE	1.03	0.969462
LEV	1.02	0.979389
Mean VIF	1.17	

Figure 6, Variance Inflation Factor, Model 2

The variance inflation factor is used to determine how much the variance of the predicted regression coefficient is inflated when the independent variables are associated. VIF =1 denotes that the independent variables are

not connected with one another. The presence of a VIF result larger than 1 implies that the variables are moderately related. Because it discovers heavily related variables, VIF has a challenging value of 5 to 10 (Shrestha, 2020). After removing outliers in two of the explanatory variables (SCE, RCE) in model 2, the (VIF) values were < than 5, all these explanatory variables are hence independent linearly, and therefore multicollinearity is not present in my data set.

5.5 Homoscedasticity Assumption

One of the conditions of regression is that the data set be homoscedastic, which indicates that the variances must be constant, rather than heteroskedastic, which means that the variances are not equal(Yang, Tu, & Chen, 2019). In the estimation of your coefficients, heteroscedasticity does not cause a bias. You cannot, however, estimate the variance-covariance matrix adequately due to heteroscedasticity. As a result, the coefficients' standard errors are erroneous. As a result, no t-statistics or p-values can be computed, and hence no hypothesis testing can be done. Overall, OLS loses its efficiency when heteroscedasticity is present, and it is no longer Best Linear Unbiased Estimator.

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of NSGR

        chi2(1)       =       0.92
        Prob > chi2   =     0.3374
```

Figure 7, Heteroskedasticity test

Based on the results we conclude that the data does not follow heteroskedasticity because the significance value of the Breusch Pagan test is 0.3374, which is greater than 0.05.

5.6 Autocorrelation Assumption

The auto correlation of a variable measures the link between its current and previous values. Ideally, there should be no auto correlation in the data set; however, we reject H0 and conclude that auto correlation exists in the data set as the pvalue of DW test is < than 0.05

To escape from the consequences of serial correlation in our data that include untrustworthy hypothesis testing and t-statistics appearing significant on levels on which they are not in actual led us to use the Prais-winston command to solve this issue. After using this command, the Durbin Watson statistic is transformed to 2.010 which means that there no serial correlation present in our data now and this procedure produced estimators that are approximately as efficient as the best linear unbiased estimators. Moreover, there is no omission of observation.

```
.
. estat dwatson

Durbin-Watson d-statistic(  4,    432) =  1.364186

    Durbin-Watson statistic (original)    1.364186
    Durbin-Watson statistic (transformed) 2.010739
```

Figure 8, Serial correlation test

5.7 Regression Analysis

There is no violation of regression assumptions of Normality, Multicollinearity, Heteroscedasticity and Autocorrelation. Before proceeding further, the normality has been achieved because the data was not normal. After achieving the normality, the distribution of data showed homoscedasticity. However, autocorrelation has been removed from the data. Moreover, the results of Hausman specification test aided in the selection of a fixed effects model in a panel data study.

Insert Table 3

When the independent variables are utilized together, the coefficient of determination (R square) denotes the percentage of effect they have on the dependent variable. In this model, R Square=0.405, implying that the link between SGR and M-VAIC accounts for 40.5 percent of the variation in SGR.

As the p-value of explanatory variable M-VAIC is < 0.01, it indicates that it is statistically significant at 1% level of Significance. Further, it can be concluded that Modified Value-added intellectual coefficient has a positive influence on Sustainable Growth Rate (SGR). The control variables SIZE has a positive influence but its relationship is insignificant for this model. Similarly, LEV is insignificant and is negatively influencing SGR.

Insert Table 4

The R- square represents the percentage of effect that the independent variables have on the dependent variable when used together. In this model, R Square= 0.440, implying that the relationship between SGR and Capital Employed Efficiency, Human Capital Efficiency, Structural Capital Efficiency, Relational Capital Efficiency (RCE), and Process Capital Efficiency justifies a 44 percent variation in SGR (PCE).

As p-value of explanatory variables Human Capital (HCE) and Process Capital (PCE) is < than 0.05, it shows that they are significant at 5% level of significance. Moreover, capital employed efficiency (CEE) is significant at 10% level. It can be concluded that HCE and PCE have a positive influence on Sustainable Growth Rate (SGR), while CEE has a negative link with dependent variable SGR. SIZE (Control variable) has a positive influence but its relationship is insignificant for this model. Similarly, LEV is insignificant and is negatively influencing SGR.

6. Discussion

The goal of this research was to explore the link between intellectual capital efficiency and corporate sustainable growth of firms in the presence of control factors. The discussion that follows is based on the results of the Panel regression. It has been widely obtained in our findings that the

combined effect or connection of capital employed and Intellectual capital components (M-VAIC) showed significant effect. Our first Hypothesis was whether M-VAIC has a significant effect on CSG or not. In this study, we tend to accept the alternative hypothesis of H1 where it is stated that there is a significant impact of M-VAIC on corporate sustainable growth. An increase of approximately 2.5% in the sustainable growth rate of firms will be caused by the increase in value added intellectual capital as the findings of table presented shows that the coefficient of M-VAIC is 0.025 As M— VAIC is a combination of CEE and ICE, we can also deduce from these results that physical capital as well intellectual capital proves to be a key driver of sustainable growth of corporations. Thus, this output is accordant with the results found by Xu et al. (2021a) & Tran and Vo (2020).

The second hypothesis stated that capital employed efficiency has a notable effect on CSG. As evident from table the CEE is significant at 10% level. These results support empirical findings of (Mukherjee & Sen, 2019). However, the coefficient value of CEE being negative (-0.03) is not in line with the literature means not enough positive link was found between CEE and its role in CSG of Pakistani companies. The third hypothesis of the study which stated Human capital efficiency (HCE) impacts corporate sustainable growth indeed showed significant results at 1% level of significance. The coefficient of HCE is 0.05 as depicted from the table above, which means that an increase of approximately 5% in the sustainable growth of firms can be observed as the efficiency of Human capital increases. This means that the HCE provides a significant contribution to the long-term growth of Pakistani firms, demonstrating that human resource knowledge, competency, and technical know-how are used effectively and efficiently in Pakistan's top corporations. These findings are greatly supported by many studies like (Saeed et al., 2016; Xu et al., 2021a) etc.

Our fourth and fifth hypothesis was whether SC and RC indicate a significant effect on CSG or not. We tend to accept the null hypothesis of H4 and H5 of this study where it is stated that no significant impact of structural capital and relational capital on corporate sustainable growth exists. In addition to being a labor-intensive economy, as well as lack of investment in R&D due to a lack of finance, a lack of cutting-edge technology and a lack of patent generation are all plausible factors for SCE's

low performance in Pakistani enterprises which is consistent with the results of a neighbouring country. (Fan & Hossain, 2018)

Our last hypothesis of the study stated that process capital's impact on CSG is notable and the results from table are in accordance with it. Therefore, we can reject the null hypothesis and deduce that with a coefficient value of 2%, it positively influences SGR and an increase of approximately 20% in the sustainable growth of firms could be observed as Process capital value increases. It indicates that effective process capital management makes businesses more capable of achieving long-term growth. This result is in line with previous studies like (Kusumawardhani, 2012; Mukherjee & Sen, 2019).

In summation, the data implies that, in addition to physical resources, components of IC– human capital and process capital – play an important role in business long-term success in Pakistan. Furthermore, the R^2 value (0.440) in Model 2 is higher than the R^2 value (0.405) in Model 1, implying that specific components of IC contribute much more to corporate long-term growth than intellectual capital as a whole. In terms of control variables, no notable relationship among firm size (FS) and Lev was found on corporate sustainable growth in both Model 1 and Model 2. Mukherjee and Sen (2019) also reported similar results for LEV in their study.

7. Conclusion

The results of the research carried out provide evidence that, in context of Pakistan, both Capital employed and IC (as a whole), as well as its components, play a crucial role in the path to CSG. It is important to note, however, that among the components of IC, human capital is the most influential factor in Pakistan's corporate sustainable growth. Taking the findings together, it is possible to conclude that IC and its components do, in fact, help pave the way for corporate sustainable growth in Pakistan.

Hence, this study will assist company owners and directors in thinking about and acting to incorporate IC resources into their businesses and reap the benefits. This research emphasizes the need of policymakers and regulatory agencies developing regulations for measuring and disclosing IC in yearly financial reports as only a handful of top 100 companies disclose

it. In today's active and competitive business environment, corporate growth management is a major challenge for executives, particularly in developing countries like Pakistan. To such an extent, this study presents Pakistani corporate executives with a motto that if IC resources are effectively engaged and taken advantage, the firm's growth and policies can be effectively controlled for future benefits. an ideal level of sustainable growth rate should be the objective as investors are not only interested in the ability to grow of a firm, instead they are more inclined towards whether the growth is sustainable or not.

The limitation of this study includes that another component of intellectual capital known as Innovation Capital was not incorporated in this study as its measurement (I-e R&D cost) was not available for all KSE-100 Index companies. Due to the misinterpretation of numerous meanings of IC and its components, there is still criticism of the Intellectual capital calculation method, as no way of measuring IC has been disclosed by researchers as flawless until now. Future studies should widen the sample base to include all enterprises from all sectors of the KSE because different sector's goal of increasing corporate sustainable growth may comprise of various different methods. E-g tourism companies will be more interested in investing in relational capital while a labor-intensive manufacturing companies would be more interested in employees' benefits (Human capital). This model can be employed cross country with the goal of generalizing the findings of this model. Further research into the relationship between Corporate Sustainable Growth and other dimensions including, Earning Management, Dividend Policy etc. could be conducted. Because the VAIC^{TM} model has been criticized primarily for its measurement of Structural capital efficiency (because to its reliance on HCE), future studies should seek out alternative methods or even design an IC measurement model that can absorb the existing criticism of the VAIC^{TM} model.

References

Asiaei, K., & Jusoh, R. (2015). A multidimensional view of intellectual capital: the impact on organizational performance. Management decision.

Avci, E., & Nassar, S. (2017). Intellectual capital and its impact on firm performance of the Turkish financial sector before and after financial crisis. PressAcademia Procedia, 3(1), 916-924.

De Luca, F., Cardoni, A., Phan, H.-T.-P., & Kiseleva, E. (2020). Does structural capital affect SDGs risk-related disclosure quality? An empirical investigation of Italian large listed companies. Sustainability, 12(5), 1776.

Emadzadeh, M. K., Afzali, N., Bagheri, A., Rahimpoor, M., Ezadi, F., & Rahmani, M. (2013). Effect of intellectual capital on firm performance. International Journal of Academic Research in Accounting, Finance and Management Sciences, 3(2), 98-103.

Fijałkowska, J. (2014). Value Added Intellectual Coefficient (VAIC™) as a tool of performance measurement. Przedsiębiorczość i Zarządzanie (Entrepreneurship and Management), 15(1), 129-140.

Fonseka, M. M., Ramos, C. G., & Tian, G.-l. (2012). The most appropriate sustainable growth rate model for managers and researchers. Journal of Applied Business Research (JABR), 28(3), 481-500.

Hifza, J., Palapa, A., & Maskur, A. (2020). The Strategic Foundation for Competitive Excellent Development in Integrated Islamic Primary Schools in Indonesia. International Journal of Advanced Science and Technology, 29, 1747-1753.

Kamath, G. B. (2014). A theoretical framework for intellectual capital disclosure. Pacific Business Review International, 6(8), 50-54.

Khalique, M., Ramayah, T., Shah, M. T. A., & Iqbal, Z. (2019). Intellectual capital and financial performance of banks in Sialkot Pakistan. Journal of management sciences, 6(1), 50-61.

Kusumawardhani, T. (2012). Intellectual Capital, Financial Profitability, and Productivity: An Exploratory Study of the Indonesian Pharmaceutical Industry. Asian Journal of Business and Accounting, 5(2).

Kwarbai, J., & Akinpelu, M. (2016). Human capital efficiency and corporate performance: The Nigerian perspective. The International Journal of Business & Management, 4(3).

Mohammadi, R., Sherafati, M., & Ismail, M. (2014). Factors affecting intellectual capital and its role in financial performance of organization. Indian J. Sci. Res, 5(1), 314-320.

Morris, C. (2015). An industry analysis of the power of human capital for corporate performance: evidence from South Africa. South African Journal of Economic and Management Sciences, 18(4), 486-499.

Mukherjee, T., & Sen, S. S. (2019). Intellectual capital and corporate sustainable growth: The Indian evidence. Asian Journal of Business Environment, 9(2), 5-15.

Nguyen, T. L. (2016). Assessing knowledge management values by using intellectual capital to measure organizational performance Nova Southeastern University].

Nimtrakoon, S. (2015). The relationship between intellectual capital, firms' market value and financial performance: Empirical evidence from the ASEAN. Journal of Intellectual Capital.

Ozkan, N., Cakan, S., & Kayacan, M. (2017). Intellectual capital and financial performance: A study of the Turkish Banking Sector. Borsa Istanbul Review, 17(3), 190-198.

Pal, K., & Soriya, S. (2012). IC performance of Indian pharmaceutical and textile industry. Journal of Intellectual Capital.

Poh, L. T., Kilicman, A., & Ibrahim, S. N. I. (2018). On intellectual capital and financial performances of banks in Malaysia. Cogent Economics & Finance, 6(1), 1453574.

Pulic, A. (2004). Intellectual capital–does it create or destroy value? Measuring business excellence.

RASHID, H. A., FAROOQ, S., LIAQAT, F., QADEER, A., & YOUNAS, N. (2020). ANALYZING THE IMPACT OF INTELLECTUAL CAPITAL ON FINANCIAL PERFORMANCE OF FOOD & PERSONAL CARE AND TEXTILE SECTORS: A COMPARATIVE ANALYSIS. Pakistan Economic and Social Review, 58(1), 35-60.

Rashid, M. K., Niazi, A. A. K., & Noreen, M. (2018). Impact of intellectual capital on firms' market value and financial performance: Empirical evidence from Pakistan. NUML International Journal of Business & Management, 13(1), 22-34.

S Mohammad, H. (2021). Intellectual capital efficiency of listed SMEs in Malaysia/Hapsah S. Mohammad. Voice of Academia, 17(2), 132-139.

Saeed, S., Rasid, S. Z. A., & Basiruddin, R. (2016). Relationship between intellectual capital and corporate performance of top Pakistani companies: an empirical evidence. International Journal of Learning and Intellectual Capital, 13(4), 376-396.

Sarwar, H., Khan, B., Nadeem, K., & Aftab, J. (2016). Human Capital, HRM Practices and Organizational Performance in Pakistani Construction Organizations: The Mediating Role of Innovation. Archives of Business Research, 4(6).

Setyawati, I., Widyastuti, T., Suryati, A., & Hartani, N. (2019). Intellectual capital performance of Islamic banks in Indonesia: Towards competitive advantages. Management Science Letters, 9(12), 1999-2008.

Sharma, J., Naqvi, D., & Chishti, K. M. (2017). International Research Journal of Management and Commerce.

Si, K., Xu, X. L., & Chen, H. H. (2020). Examining the interactive endogeneity relationship between R&D investment and financially sustainable performance: comparison from different types of energy enterprises. Energies, 13(9), 2332.

Smriti, N., & Das, N. (2017). Impact of intellectual capital on business performance: evidence from Indian pharmaceutical sector. Polish Journal of Management Studies, 15.

Tarigan, J., Listijabudhi, S., Elsye, S., & Widjaja, D. C. (2019). The impacts of intellectual capital on financial performance: an evidence from Indonesian manufacturing in. Indonesian Journal of Business and Entrepreneurship, 5(1), 65-76.

Tran, N. P., & Vo, D. H. (2020). Human capital efficiency and firm performance across sectors in an emerging market. Cogent Business & Management, 7(1), 1738832.

ul Rehman, W., & Jalil, L. S. F. (2021). Revisiting the Nexus Between Intellectual Capital and Performance of BRICS Financial Sector.

Ulum, I., & Syam, D. (2017). Modified value-added intellectual coefficient (MVAIC) and traditional financial performance of Indonesian biggest companies. International Journal of Learning and Intellectual Capital, 14(3), 207-219.

UNDP, U. (2019). Population Growth: Implications for Human Development.

Xu, J., & Wang, B. (2018). Intellectual capital, financial performance and companies' sustainable growth: Evidence from the Korean manufacturing industry. Sustainability, 10(12), 4651.

Xu, X. L., Li, J., Wu, D., & Zhang, X. (2021a). The intellectual capital efficiency and corporate sustainable growth nexus: comparison from agriculture, tourism and renewable energy sector. Environment, Development and Sustainability, 23(11), 16038-16056.

Xu, X. L., Li, J., Wu, D., & Zhang, X. (2021b). The intellectual capital efficiency and corporate sustainable growth nexus: comparison from agriculture, tourism and renewable energy sector. Environment, Development and Sustainability, 1-19.

Yaseen, S. G., Dajani, D., & Hasan, Y. (2016). The impact of intellectual capital on the competitive advantage: Applied study in Jordanian telecommunication companies. Computers in Human Behavior, 62, 168-175.

Determinants of Out-of-Pocket Health Expenditure in Pakistan: Empirical Insights from Micro-level Data

*Ayesha Arshad Hammad **Salahuddin Ayyubi & ***Zahid Iqbal

ABSTRACT: Out-Of-Pocket (OOP) health expenditure is an internationally recognized measure of health expenditure at household level, especially in middle income countries. This study explores various socio-economic and demographic determinants of OOP health expenditure in Pakistan. The descriptive analysis and regression type results using Variance-Weighted Least Squares (VWLS) method were generated to find out the nature of impact and the significance of various determinants of health expenditures. As per the findings, the average yearly OOP disbursement on household health was around RS. 13,897 (nearly 3% of household consumption expenditure). The impact of factors like household size, smoke consumption, the number household-dependents, average household education, and consumption expenditure was found statistically significant while having positive effect on OOP health expenditure in the estimated model. Households with the facilities of piped water, proper sanitation and garbage disposal system were having less spending on health. The results have shown that in rural Baluchistan, gas connection was having low impact and number of under-five children had highest impact on OOP health expenditure, while in urban Baluchistan piped water had lowest impact on health spending. The signs of the variables used in this study were in line with the dominant view of the literature.

Keywords: Out-of-Pocket health expenditure, Household, VWLS, Pakistan

1. Introduction

Household spending patterns are being influenced by a host of factors and some categories of such expenses are important for academicians, corporations, politicians and policy makers alike. One of the most important categories of household expenditures, especially in the developing countries, is argued to be the health expenditure, because of its unavoidable and imperative nature as a distinctly different type of expense. The main

* Lecturer, FAST NUCES Lahore, ayesha.arshad@nu.edu.pk
** Assistant Professor, Forman Christian College (A Chartered University), salahuddinayyubi@fccollege.edu.pk
*** Associate Professor, Forman Christian College (A Chartered University), zahidiqbal@fccollege.edu.pk

sources of health expenditures include public and private healthcare expenses. OOP health expenditure is a globally recognized measure of household health expenditure & a dominant source of private health expenditure in many developing countries. According to World Health Organization (2017), payments made at time of receiving any type of treatment, from any type of provider, for any type of disease or health problem are called OOP health expenditures. Such payments exclude any reimbursement by a third party such as the government, a health insurance fund or a private insurance company. According to Pakistan Bureau of Statistics (2018), OOP health expenditure is defined as direct payments for health services from income or saving of households. However, such payment might be compensated later by employers or by health insurance.

According to the report of National Health Accounts (NHA) 2019-20, total health expenditure is comprised of current and capital health expenditure. Capital health expenditure is, sometimes, also known as development expenditure. Only direct health expenditures are incorporated in current health expenditure while indirect expenses like health related expenditures on medical education, training & research are excluded from the total health expenditure.

The report of NHA 2019-20 indicates that out of total health expenditures in Pakistan, 39.8% were made by general government and the rest by private sources. OOP health expenditures constituted 52.8% of total health expenditures in 2019-20. Private expenditures constituted 59.7% of total health expenditures in Pakistan, out of which 88.6% were OOP health expenditures (i.e. 52.8% of total health expenditure) in 2019-20. The breakup of the government health expenditure remained as follows: 26.6 % share of federal and provincial government, 7.2% share of district or Tehsil government, 3.7% of military health expenditure, 0.5% share of development partner or official donor organizations, and 1.2% of social security funds in total health expenditures. The estimates of National Health Accounts 2019-20 also indicate that OOP expenditures on health in Punjab has the highest share (i.e. 53%) while Baluchistan

(63.97%) has the lowest share of OOP health payments (Pakistan Bureau of Statistics, 2022).

Many researchers have studied the factors affecting OOP healthcare expenditures and investigated their catastrophic effects. Bedado et al. (2022) used multiple variable logistic regression model in a cross-sectional study to find out determinants of OOP health expenditures. The results have shown that OOP health expenditures were significantly associated with various factors like family size, income, residence and status of education. Alemayehu et al. (2023) focused on understanding the patterns and the determinants of OOP health expenditures among adult patients with hypertension to analyze economic challenges faced by patients with such health issues. They used multiple linear regression model and identified that factors like wealth index, gender, distance from the hospital, and frequency of visit to hospital resulted in high OOP health expenditures.

1.1 Significance of the Study

World Health Organization (2017) highlights the significance of OOP health payments in Sustainable Development Goals (SDGs) by setting target number 3.8 for the achievement of universal health coverage which is one measure of performance for SDG 3 about good health and well-being. Moreover, SDG indicator 3.8.2 "Proportion of large household health expenditures on health as a share of total household expenditure" focuses on OOP health expenditures. SDG 3 aims to strengthen health systems of all the countries because there are deteriorating conditions of health financing systems in many countries that might lead towards high OOP health expenses, prompting financial hardship.

According to the report of World Health Organization (2019), OOP expenditures are a major source of health financing in middle income countries as compared to low and high income countries. In low income countries, financial barriers could be the reason of low OOP payments whereas high income countries might be facing financial hardship due to OOP expenses on medicines (World Health Organization, 2019). Around 57.6% of total health expenditure have been paid by individual households as OOP payments in 2015-16 where annual per capita health expenditure of Pakistan is 45US$ and the ratio of total health expenditure to GDP is 3.1% (Pakistan Bureau of Statistics, 2018).

1.2 Research Gap

There are many factors that affect the OOP health expenditure in Pakistan. A lot of research has been conducted, around the globe, to evaluate the patterns and determinants of such expenses. However, little attention has been paid towards this issue in Pakistan. One study of Muhammad Malik & Azam Syed (2012) has focused on determinants of OOP payments by extracting data from Household Integrated Economic Survey (HIES) 2004-05 and employing OLS technique. Rehman et al. (2014) have descriptively gathered and analyzed primary data to see the pattern of OOP health expenditure of under-five children in slum areas of Islamabad. Another study by Khalid & Sattar (2016) has done descriptive analysis to examine the pattern of OOP expenditures by pooling six HIES surveys from 1998-2011. Datta et al. (2019) have used logistic regression on data of HIES (2015-16) to check the relationship between medical cost and diseases and to see the critical trends of health expenditure in Pakistan. They have considered only two diseases (blood pressure and diabetes) to understand how these are linked with financial hardship in Pakistan. However, in previous literature of Pakistan, determinants of OOP payments have not been inspected by using the most recent data of HIES in Pakistan. This research was needed to analyze the pattern of OOP health expenses and to find out the important household determinants of such expenditures in Pakistan.

In addition, this study has shown the impact of various factors like smoke consumption and average household education on OOP health expenditure via different econometric models. In the literature, it was either taken as a dummy variable or as the expenditures on smoke. This research, however, modified the 'smoke' variable as the quantity (in units) of smoke consumed by households. Moreover, regarding education, the existing literature focused mainly on household head's education or on spouse education. This study, however, has analyzed the impact of average education of the household instead of just focusing on the education of household head or spouse.

Hence, this study has examined the pattern of OOP expenses on health as well as probed significant causes of OOP health expenditures by

using the most recent data of Pakistan Social and Living Standards Measurements (PSLM)/ Household Integrated Economic Survey (HIES) 2018-19.

1.3 Problem Statement

There is a huge burden of health expenditure at household level where households have different capacity to endure or avoid such expenses. Therefore, it is important to know the circumstances that might affect burden of health expenditure as measured by OOP payments. Keeping this in mind, this study aims at exposing household characteristics for their expected and observed effects on OOP health expenditure in Pakistan.

1.4 Objectives of the Study

This study aimed at exposing household characteristics for their expected and observed effects on OOP health expenditure. Likewise, it explored the nature and significance of numerous factors that might influence OOP expenditures at household level.

The key objectives of this research are:

• To systematically assess nationwide household OOP health disbursements in Pakistan.

• To explore the determinants of OOP health expenditure in Pakistan.

2. Literature Review

Many researchers have elucidated the causes of high OOP health expenditure. Most of the studies have either focused on characteristics of household head like age, gender, marital status, education and employment status; or on characteristics of other household members such as age group, household size, household income and expenditure. Other conditions of household like wealth status, living condition and nature of residence have also been probed for comprehensive exploration of this issue.

Household size has remained an important determinant of OOP health payments that represents total number of members of household. Many studies have found out positive association between OOP health

expenditures and size of household, implying that larger households would be prone to have more spending on health [Mamun et al. 2018; Paul et al. 2018; Sekyi & Domanban, 2012; Pal, 2010; Costa-Font et al. 2007; Rous & Hotchkiss, 2003; Rubin & Koelln, 1993]. The results of Brinda et al. (2014) showed that households having more than five members incur more OOP expenditures. According to Oudmane et al. (2019), more than seven members in a household were positively related to OOP health expenditure. In contrast, Minh et al. (2013), da Silva et al. (2015), and Lee et al. (2019) explained the negative relationship between household size and OOP payments, depicting that larger households would spend less. Yardim et al. (2010) found out in their study that household size had no effect on catastrophic health expenditure and Mugisha et al. (2002) also found it insignificant in their study.

The age group of household members secures a central position in the discussion of moderators of OOP health expenditures. Some studies have also explored the effect of age of household head. More OOP expenditures in household were exposed due to increasing age (Mugisha et al. 2002; and Pannarunothai & Mills, 1997) especially above 65 years (You & Kobayashi, 2011), while household head was negatively related to OOP spending on health (Brinda et al. 2012; Pal, 2010; Rous & Hotchkiss, 2003). The positive effect of age was explained by many researchers. According to Farahat et al. (2018), for women between 18-40 years and men between 40-60 ages had positive relationship with OOP payments. OOP expenditures were higher for age of household members with ages 15 years or above, however, smaller for household members with ages between 10-14 years (Rous & Hotchkiss, 2003).

While analyzing the household characteristics affecting OOP health expenditure, children and elders were mostly considered as vulnerable members of a household and were given more attention. The results of Hailemichael et al. (2019), Paul et al. (2018), Amaya-Lara (2016), Minh et al. (2013), Muhammad Malik & Azam Syed (2012), and Pal (2010) revealed that the households with vulnerable members had positive relationship with OOP health expenditure because they were likely to have more health needs. Households having preschool children were estimated to have high OOP expenditures on health (Kumara & Samaratunge, 2016).

However, there was a negative association between OOP health expenditure and vulnerable age group found by Mamun et al. (2018) and it was also found this of a household that has at least one child and no elderly by Muhammad Malik & Azam Syed (2012). According to Oudmane et al. (2019), Njagi et al. (2018), and Yardim et al. (2010), presence of young children had the negative affect while presence of the elderly people in the household was having a positive effect on OOP health expenditure. The results of Molla et al. (2017) found no significant impact of the presence of under-five children and elderly members on OOP health payments.

Education and employment status are essential in order to analyse the impact of household characteristics on OOP health expenditures. The results of Kumara & Samaratunge (2016), da Silva et al. (2015), Muhammad Malik & Azam Syed (2012), You & Kobayashi (2011), Okunade et al. (2010), and Yardim et al. (2010) demonstrated that education of household head was a positive predictor of OOP health expenditures. In contrast, Oudmane et al. (2019), Njagi et al. (2018), Molla et al. (2017), Brinda et al. (2014), Costa-Font et al. (2007), Rous & Hotchkiss (2003), and Pannarunothai & Mills (1997) explained the negative relationship between household head education and OOP health expenses. The possible reason considered was that more educated people might have better exposure of heath perils. According to Pal (2010), female education, especially in rural areas, reduced OOP health payments. Older and highly educated household heads were also negatively associated with OOP health payments (Rous & Hotchkiss, 2003). According to Sen & Rout (2007), household head's education had insignificant positive relationship with OOP health payments. Moreover, Muhammad Malik & Azam Syed (2012) considered education of household head spouse to be an important factor which had a positive impact of such payments as well.

Profession of head of household was used by some authors. There was a negative relationship of OOP health expenditures with white collar jobs (Muhammad Malik & Azam Syed, 2012) and with households working as manual labor (Brinda et al.2014). According to Sekyi & Domanban (2012), Oudmane et al. (2019), and Yardim et al. (2010) employment status was considered to be the positive predictor of such expenses where they assumed that employed persons had high opportunity

cost of illness as well more capacity to pay for health care resulting in higher OOP health expenditures. However, Njagi et al. (2018), and Amaya-Lara (2016) found negative relationship between OOP health payments and employment showing that there might be more number of working members in household that reduced OOP health payments. Moreover, negative association was considered due to the duration of occupation (Okello & Njeru, 2015) and formal employment (Buigut et al. 2015).

Household income and expenditure play a vital role while studying health spending. Household income is a good indicator of household capacity to spend whereas expenditures show households' tendency to spend. Income is usually measured by expenditure due to lack of income data of households in many developing countries. And it was having negative relationship with OOP health payments [Sekyi & Domanban (2012), Oudmane et al. (2019), Pannarunothai & Mills (1997)]. In contrast, Mamun et al. (2018), Molla et al. (2017), Amaya-Lara (2016), Okello & Njeru (2015), da Silva et al. (2015), You & Kobayashi (2011), Okunade et al. (2010), Sen & Rout (2007), Rous & Hotchkiss (2003), Rubin & Koelln (1993) have explicated positive relationship between household income and OOP health expenditure.

Among other household head characteristics gender also gets attention. According to Oudmane et al. (2019), Molla et al. (2017), Sekyi & Domanban (2012), You & Kobayashi (2011), Okunade et al. (2010), Pannarunothai & Mills (1997), gender of household head had a negative impact on OOP health expenditures. Male household head experienced less OOP health expenses (Muhammad Malik & Azam Syed, 2012) whereas households with male head incurred more OOP health expenses found by Mamun et al. (2018), Rous & Hotchkiss (2003), and Brinda et al. (2012). Furthermore, many studies had considered a positive relationship between household head's gender and such payments [Pal (2010), Mugisha et al. (2002), Costa-Font et al. (2007), Brinda et al. (2014)]. Njagi et al. (2018) extensively reviewed previous literature and concluded that different studies displayed diverse effects of gender but, on the whole, women were exposed to incur more health spending.

According to Pal (2010), method of cooking, household asset index and the access to electricity negatively predicted OOP expenditures on

health. Method of cooking and household's access to electricity indicate household's capacity to make expenses. Safe cooking methods have two dimensional relations as it showed more wealth as well as better health. In addition, household asset index also depicted the well-being of households. According to the study of Pal (2010), Household asset index consisted of various indicators i.e., radio, television, air conditioner, air cooler, sewing machine, refrigerator, bicycle, motorcycle, car. Rubin & Koelln (1993) reported a positive association between asset index and such expenses for non-elderly members. According to Okunade et al. (2010), wealth index was positively associated with OOP expenditures on health.

The study of You & Kobayashi (2011) considered good toilet facility and good sanitation as negative predictors while good water as positive predictor of OOP health payments. According to Muhammad Malik & Azam Syed (2012), OOP health expenditures had a positive relationship with unhygienic toilet and unsafe water. There was negative relationship between OOP health expenditure and water [Mamun et al. (2018)] and with lack of plumbed toilet [Brinda et al (2012), Brinda et al. (2014)]. Additionally, OOP health expenditures were negatively associated with piped water, good sanitation and good garbage disposal system (Rous & Hotchkiss, 2003). According to Mamun et al. (2018), access to sanitation was positively associated with OOP health expenses. Moreover, a positive relationship between travelling cost to health facility and OOP health payments, depicting that households far from health facility were likely to incur more OOP health expenses, was found by Muhammad Malik & Azam Syed (2012), and Njagi et al. (2018). In contrast, Kumara & Samaratunge (2016) explained that less distance to government was linked with more OOP health payments.

Consumption of smoke has also serious effects on health. In the literature, it was either taken as a dummy variable or as the expenditures on smoke. This research, however, modified the variable as the quantity of smoke consumed by households. Costa-Font et al. (2007) Rous & Hotchkiss (2003) found out positive impact of smoke on OOP health expenditures, stating that households with consumption of smoke were making more spending on health. Some studies reported that households living in rural areas have high OOP spending [Njagi et al. (2018), Amaya-

Lara (2016), Minh et al. (2013), You & Kobayashi, (2011), Yardim et al. (2010)]. According to Rous & Hotchkiss (2003), OOP health expenditure was negatively associated with households residing in urban areas.

Besides the determinants of OOP health expenditures, there were some studies measuring the catastrophic effects of OOP expenditures as well. According to Dorjdagva et al. (2016), catastrophic health expenditures were higher in richer households who had more capacity to pay. Xu et al. (2011), and Xu et al. (2003) analyzed health expenditures of multiple countries with results of cross country analysis showing that there were disparities in catastrophic health expenditures of different countries. The catastrophic OOP health expenses fall the poor segment of society into poverty trap. To curb the catastrophe arising as a result of high OOP health expenditures, policy implications are needed by the researchers.

From this literature review, it was found that household level socio-economic variables were worth exploring determinants of OOP health expenditure in various countries around the globe. Mainly, micro level studies, employing cross-sectional survey data, were conducted to study household OOP health expenditures. In addition, various econometric methods (mostly Simple Least Squares) were employed by researchers. It is learnt from an erudite discussion that almost all studies, while exploring determinants, have performed regression analyses by using different econometric techniques.

3. Methodology

The model of demand for health, constructed by Grossman (1972), was used for the theoretical understanding of this study. Grossman's model of health demand brought a great development in the field of health economics. The data for this study was extracted from PSLM/HIES 2018-19. This survey was conducted by Pakistan Bureau of Statistics (PBS).

Since the data used in this research was cross-sectional in nature, the Variance-Weighted Least Squares (VWLS) regression model was employed which resolves the problem of heteroscedasticity. The problem of heteroscedasticity is common in cross-sectional data. In the presence of heteroscedasticity, OLS estimators become inefficient. In order to get

homoscedastic variance (i.e. efficient results) it is favorable to use VWLS regression. Mostly, VWLS is helpful in case of data related to scientific measurements, having errors of measurement with known sizes. Further, it can also be used in case of categorical analysis of data (data with categorical independent variables and continuous/discrete dependent variable).

VWLS regression can be fitted in the following type of econometric model:

$$y_i = X_i b + \varepsilon_i$$

Where
y_i denotes dependent variable
X_i denotes a list of independent variables
ε_i denotes error term with normal distribution as mentioned below:
$$\varepsilon_i \sim N\ (0, v_i)$$

VWLS regression follows the assumption (mentioned in equation 2) that the estimates s_i^2 for the variance v_i are already in the regression model: the error variance is not needed to be estimated). VWLS regression estimates large standard error errors for the coefficients in the regression analysis. However, it should be noted that VWLS cannot be appropriately used if only the relative proportion of the error variance of y_i is estimated.

3.1 Model Specification

The general model employed to see the impact of different variables on OOP health expenditure is as follows:

$$OOP = \beta_0 + \beta_1 HHSIZ + \beta_2 HHEXP + \beta_3 SMOKE + \beta_4 EDU + \beta_5 CHILD + \beta_6 ELDER + \beta_7 WATER + \beta_8 SANI + \beta_9 GARB + \beta_{10} ELEC + \beta_{11} GAS + \varepsilon$$

Where

OOP:	Out-Of-Pocket Health Expenditure
HHSIZ:	Household Size
HHEXP:	Household Consumption Expenditure
SMOKE:	Smoke Quantity
EDU:	Average Household Schooling

CHILD: Number of Under-5 Children

ELDER: Number of Elders (65y or Above)

WATER: Piped Water

SANI: Proper Sanitation

GARB: Proper Garbage Disposal

ELEC: Electricity in Household

GAS: Gas in Household

ε: Error Term

The impact of these variables on OOP health payments was seen in all the estimated models. The details about coefficients, their signs and significance, has been presented in section 4 (Results and Discussion).

In 2018-19, average education of household decreased to 2.8 years ranged from 0 to 21 years. Looking at the variable of smoke quantity, on average 323 units of smoke were consumed per household ranged from 0 to 18300 units. These statistics can be seen in table 1 and table 2.

Table 1

Summary Statistics of Variables

Variables	Mean	SD	CV
OOP	13897	30061	216.3
HH Expenditure	411815	375099	91.1
Under-5 Children	0.85	1.1	126.4
65y or Above Elders	0.25	0.53	209
HH Size	6.5	3.23	50
Average HH Schooling	2.8	2.9	105.9
Smoke Quantity	323	611	188.9

Table 2

Summary Statistics of Dummy Variables

Variables	Mode	Skewness	Kurtosis
Electricity (lighting fuel)	0	0.54	1.3
Gas (cooking fuel)	1	-2.49	7.2
Piped Water	0	1.63	3.7
Sanitation	0	1.28	2.6
Garbage	0	1.1	2.1

4.   Results and Discussion

The results of estimated model have shown the impact of various factors on the household OOP health expenditure in Pakistan. Moreover, ten sub-samples of the model were estimated to explain the impact of these factors in urban and rural settings separately. As the anthropological, economic, social and climatic distribution vary distinctly across provinces in Pakistan, therefore, besides aggregate sub-samples of OOP health expenditure for data were estimated for rural and urban settings, disaggregated sub-samples were also estimated for each of the four provinces.

Each sub-sample shows the impact of eleven different variables on OOP health expenditure of Pakistani households. All the estimated coefficients of all the selected variables in the model and the sub-samples were statistically significant at 99% confidence. The variance inflation factor (VIF) was estimated to detect the problem of multi-collinearity in the estimated model and its sub-samples. VIF value was less than 1.5 in the estimated model and all of its sub-samples, predicting no issue of multi-collinearity. Moreover, the problem of heteroscedasticity was resolved after using VWLS method. Since this study used cross sectional data, other data issues like autocorrelation or stationarity were not relevant. The strategy adopted to explain the model and its sub-samples was to discuss the impact of each of the eleven variables at aggregate as well disaggregate levels to compare the influence of each of the eleven variables on OOP health expenditure in Pakistan at household level for all the selected categories of analysis. The complete model and sub-sample summaries are shared in the Appendix.

4.1 Findings of the Study

The impact of **household size** was found positive of household OOP health expenditure in the estimated model, resulting into an increase in household OOP health expenditure due to increase in household size. The highest impact was in rural KP while the lowest was in urban Sindh. On average, for an increase of one household member there was an increase in household OOP health expenditure of RS. 60.9 in the rural households

while that of RS. 63 in the urban areas. There was an increase in OOP health expenditures of RS. 68 in rural KP and RS. 50 in urban Sindh.

There were two other variables that had a positive impact on household OOP health expenditure, namely, **the number of under-five children** and **elderly** in household. Both these variables were constructed to see the impact of number of dependents in the household on its OOP health expenditure, assuming the household members in each of these two groups to be the dependents. The number of under-five children in household had positive impact on OOP health expenditure, explaining the increase in OOP health payments for an increase of one under-five child in household.

Just like the number of under-five children, the number of elderly members in household also had a positive impact on OOP health expenditure. Among provinces, the impact was highest in urban Punjab and smallest in rural KP. On average, for an increase of one elderly member in the household there was an increase in household OOP health expenditures of RS. 2642 in urban Pakistan and RS. 2654 in rural Pakistan. In addition, the impact was estimated to be RS. 2647 in rural KP and RS. 6822 in urban Punjab.

Average **education** of household had positive impact on household OOP health expenditure whereby an increase in one year of education of household caused increased OOP health expenditure. The rationale for such an impact could be better realization of health-related expenditure to be carried out for improved human capital formation, as a consequence more education. The impact was highest in rural KP and smallest in urban Baluchistan. In the estimated model, the impact on average was more in the rural households than in the urban households (perhaps the difference between more and less educated person, in terms of realization of health expenditures' importance, is more in rural areas than in the urban areas). On average, for an increase of one year of education of household there was an increase in household OOP health expenditures of RS. 167 in in urban Baluchistan and nearly RS. 298 in rural KP.

There was a positive impact of **household expenditures** on household OOP health expenditures in Pakistan whereby an increase in

overall household expenditures caused increased household OOP health expenditures in the estimated model. The impact was highest in rural Punjab and smallest in urban Baluchistan. In the estimated model, the impact was greater in rural settings than in the urban settings. On average, for an increase of RS.10000 in household consumption expenditure, there was an increase in OOP health expenditures of RS. 233 in urban Baluchistan and nearly RS. 305 in rural Punjab while all the other settings were within this range of rural and urban Punjab.

The quantity of **smoke consumption** had also positive impact on household OOP health expenditures in Pakistan where an increase in smoke consumption resulted in an increase in household OOP health expenditures in the estimated model. The impact was highest in urban Sindh and smallest in rural Punjab. On average, for an increase of RS.1000 units of smoke consumption there was an increase in household OOP health expenditures of RS. 1394 in Pakistan, RS. 1448 in urban Sindh, and RS. 1350 in rural Punjab.

The impact of all the other variables, including piped water, sanitation, garbage disposal, and gas, was negative on household OOP health expenditure in Pakistan in the estimated model. The negative impact of **piped water** on household OOP health expenditure depicted that households with piped water facility enjoyed better health conditions and therefore required less health expenditure. The urban households of Baluchistan with piped water facility spent around RS. 805 less than other households who were not having that facility, while the rural households of KP incurred nearly RS. 960 less than the other households.

There was a negative impact of proper **sanitation** in household on OOP health expenditures in Pakistan. The negative impact showed that households who had the facility of proper sanitation system spent less household OOP health expenditures in the estimated model than those households that did not have that facility. Households of urban Baluchistan with proper sanitation system spent around RS. 3461 less than the other households.

There was negative impact of proper **garbage disposal** system on OOP health expenditure in the estimated model. The impact explained that households with proper garbage disposal system had spent on average less on OOP health expenditures than those households who did not have proper garbage disposal system in the estimated model, the scale of this impact varied widely across the categories, however. In the urban areas of KP, the households having proper garbage disposal system spent around RS. 2858 less than the other households.

The impact of household **gas connection** was found negative of household OOP health expenditure. The negative sign indicated that households with gas connection had spent on average less on OOP health expenditure than those households that did not have gas connection whereas positive sign depicted that households that use gas as cooking fuel had spent on average more than the other households. The rural households that used gas as cooking fuel disbursed less OOP health expenditures than the other households. Among rural areas, the impact was highest in Baluchistan while smallest in Punjab. In rural Baluchistan, the households with gas paid nearly RS. 1980 less than the other households, while in rural Punjab the impact was RS. 2073 less than the other households. In urban areas, the impact of gas on OOP health payments for the whole country was found negative than its estimated impact on urban households of all the four provinces. On average, households using gas as cooking fuel spent RS. 2042 less than those households that did not use gas for cooking purposes. When the impact was seen specifically for urban households of provinces, contrarily, households using gas as cooking fuel had spent on average more than the other households. The households who used gas for cooking purposes on average spent RS. 494 more in urban Punjab and RS. 707 more in urban Baluchistan.

Electricity had a positive impact on household OOP health expenditures, explaining that households with electricity connection spent more on OOP health expenditures those households who did not have electricity connection. The results showed positive sign with the exception of rural Baluchistan. The results showed an increase in the health expenditure for the households with electricity connections. The impact was more in urban settings than in the rural settings. The rural-urban gap

was widest in the case of KP where the impact was almost twice as much as was in the case of rural KP.

4.2 Discussion

In this study, the sampling unit of analysis of this research was household with the recall period of one year. The OOP health expenditure of households with one-year recall period usually revealed fewer zero values (Muhammad Malik & Azam Syed, 2012). The findings of different variables used in this this study confirmed the results of previous research.

The variable '**household size**' was expected to have a positive impact on household OOP health expenditure as presented by the existing literature, specifying that larger households would incur more OOP health expenditure [Mamun et al. 2018; Paul et al. 2018; Sekyi & Domanban, 2012; Pal, 2010; Costa-Font et al. 2007; Rous & Hotchkiss, 2003; Rubin & Koelln, 1993]. In contrast, Minh et al. (2013), Silva et al. (2015), and Lee et al. (2019) explained the negative relationship between household size and OOP payments. Contrary to the studies showing negative impact, the results of this research were aligned with the positive impact of household size on OOP health payments. In addition, the positive effect of **smoke consumption** by households was also studied in the literature. The findings of this research were supported by Costa-Font et al. (2007) Rous & Hotchkiss (2003) who found out increased OOP health expenditures as a result of smoke.

While analyzing the household characteristics affecting OOP health expenditure, **children** and **elders** were mostly considered as vulnerable members of a household. The results of these two variables carried the positive sign, consistent with the literature, and were statistically significant also. These findings were in line with the results of Hailemichael et al. (2019), Paul et al. (2018), Amaya-Lara (2016), Minh et al. (2013), Muhammad Malik & Azam Syed (2012), and Pal (2010) revealing that the households with vulnerable members had positive relationship with OOP health expenditure because they were likely to have more health needs.

Education was also essential to analyze the impact of household characteristics on OOP health expenditures. The findings of this study were

based on the fact that more educated people take greater care of their health. This study analyzed the impact of average education of the household instead of just focusing on the education of household head or spouse. The existing literature focused mainly on household head's education. The positive and significant relationship between education and OOP health expenditures was corroborated by the findings of Kumara & Samaratunge (2016), Silva et al. (2015), Muhammad Malik & Azam Syed (2012), You & Kobayashi (2011), Okunade et al. (2010), and Yardim et al. (2010), demonstrating that education of household head was a positive predictor of OOP health expenditures. The findings of Muhammad Malik & Azam Syed (2012), however, showed education of household head's spouse to have a positive impact on OOP health expenditures. In contrast, Oudmane et al. (2019), Njagi et al. (2018), Molla et al. (2017), Brinda et al. (2014), Costa-Font et al. (2007), Rous & Hotchkiss (2003), and Pannarunothai & Mills (1997) held a different view, explaining the negative relationship between household head education and OOP health expenses.

Household income and **consumption expenditures** have been interchangeably used in the existing literature of health spending. Household income is a good indicator of the capacity of household to spend whereas expenditures show households' tendency to spend. To discuss the variable of interest, namely, household consumption expenditures, it could be seen that its impact on OOP health expenditure was positive and statistically significant in this research. These results were consistent with the study of Yardim et al. (2010) which concluded the positive relationship between per capita household expenditure and OOP health payments.

The negative sign of the coefficient for dummy variables like **piped water**, **sanitation** and **garbage disposal** indicated a negative impact of these variables on household OOP health expenditure whereby households with facilities of piped water, proper sanitation and garbage disposal system had spent less on health than those households that did not own such facilities. The results for each of these variables carried the expected signs (negative sign) and were also statistically significant. The findings of You & Kobayashi (2011) have corroborated the negative impact of proper sanitation but opposed the finding of piped water as a negative predictor of OOP health payments. The negative impact of piped water was in line with

the findings of Mamun et al. (2018), Muhammad Malik & Azam Syed (2012), and Rous & Hotchkiss (2003). Additionally, the negative sign of proper sanitation and garbage disposal system was consistent with the findings of Rous & Hotchkiss (2003). However, the findings of Mamun et al. (2018) provided a different view regarding sanitation stating that households having access to sanitation had spent more OOP health expenses.

Household's access to **gas** and **electricity** indicates household's capacity to make expenses. However, methods of cooking have two dimensional relations as it indicates more wealth as well as better health. The findings of this research observed the positive impact of electricity in Pakistan. There was a negative sign of gas for all the estimated model and all the sub-samples with the exception of urban dwellings of four provinces, which observed positive impact of gas on OOP health expenditures. The study of Pal (2010) has corroborated the negative impact of gas on OOP health expenditures. On the contrary, the positive sign of electricity was not matched with the study of Pal (2010) that concluded electricity to be negatively affecting OOP health expenditures.

Unlike Rahman et al. (2020) Datta et al. (2019) Lee et al. (2019) Brinda et al. (2018) Farahat et al. (2018) Njagi et al. (2018) Paul et al. (2018) Kumara & Samaratunge (2016) Brinda et al (2012) You & Kobayashi (2011) Pannarunothai & Mills (1997) this study could not analyze the impact of diseases on OOP health expenditures due to some limitations of data.

From this detailed discussion of the estimated results, it was concluded that the research hypothesis could not be rejected. The coefficients of different socio-economic and other variables have indicated the significant impact on household OOP health expenditure in Pakistan. The comparison of these results with the earlier research would not be conclusive in itself as these comparisons find constraints in terms of differences in nature of data, econometric models, and estimation techniques. Some significant differences in the time period of data and unit of analysis were also revealed while reviewing the previous studies.

5. Policy Implications

Healthcare system directly affects the economy of a country. Pakistan is a struggling economy with poor health indicators in the region. By investing in health through a health sensitive budget, Pakistan could not only be saving lives and promoting human rights, it can also further its economic interests strategically for a safer, healthier and wealthier Pakistan.

Understanding the determinants of OOP health expenditures can help policymakers develop possible strategies to reform the overall healthcare system. Regarding the policy implications, targeted financial support could be provided to vulnerable groups to alleviate the financial burden of healthcare expenditures. Further, regulating healthcare cost including consultation fee, diagnostic tests and other healthcare expenditures can prevent healthcare providers from overcharging pateints. There is a dire need for investment in health education and preventive programs to promote a healthier lifestyle. Moreover, continuous monitoring and evaluation of policies could also play a vital role in improving the overall performance of healthcare system.

6. Conclusions

From this study, the research hypothesis, providing the basis of the argument that various factors influence spending on health, was proved. The coefficients of different socio-economic and other demographic variables have indicated the significant impact on household OOP health expenditure in Pakistan. Surprisingly, the signs of many variables used in this study were in line with the dominant view of the literature. The impact of factors like household size, smoke consumption, the number of under-five children and elderly in household, average household education, and consumption expenditure was found positive and statistically significant of OOP health expenditure in all the estimated models. Households with the facilities of piped water, proper sanitation and garbage disposal system were having less spending on health.

As per findings of **Sindh** data, <u>household size</u> had relatively ***low*** impact while <u>smoke consumption</u> was having ***highest*** impact on OOP health expenditure in *urban* Sindh.

The results of **Punjab** showed that there was ***highest*** influence of <u>consumption expenditure</u> and <u>gas</u> on OOP health payments, and ***lowest*** impact of <u>smoke consumption</u> and <u>garbage disposal</u> in *rural* Punjab. In *urban* Punjab, the <u>number of elderly members</u> in household had ***highest*** impact on OOP heath spending.

In *rural* **Baluchistan**, <u>gas connection</u> was having ***low*** impact and <u>number of under-five children</u> had ***highest*** impact on OOP health expenditure. In *urban* Baluchistan <u>piped water</u> had ***lowest*** impact in both times. The province-wise results showed that there was ***less*** influence of <u>number of under-five children</u>, <u>consumption expenditure</u>, <u>average household education, piped water</u>, and <u>proper sanitation</u> in *urban* Baluchistan.

The results of **KP** described that the households with <u>electricity</u> and <u>elderly members</u> had ***lowest*** effect on OOP health expenses and households with <u>piped water, proper sanitation</u> were having ***highest*** influence in *rural* KP. In *urban* KP, households with the facility of <u>electricity</u> and <u>garbage disposal</u> had ***highest*** impact on OOP health spending.

The comparison of these results with the earlier research might not be conclusive in itself due to many constraints (like differences in data, estimation techniques). However, the results of this study are hoped to be useful in policy analysis for household support in dealing with health expenses.

7.   Limitations and Scope for Future Research

There is two-dimensional effect of health-related expenditures. On one hand, health expenditures affect health status, while, on the other hand, health status influences health expenses. This causal relationship between OOP expenditure on health and status of health was not analyzed in this study. Further, as the data used for this research was survey-based, it could have some implications of recall bias (some respondents might not easily recall expenses). In addition, supply side factors of health care (such as healthcare providers) were not considered due to the unavailability of such information in data used in this research. Hence, there can be further improvements in this study if household surveys add some other health related aspects in data. For future research in this area of study, researchers can explore OOP health expenditure by using different nature of data, unit of analysis, econometric models, or estimation techniques.

References

Alemayehu, M., Addis, B., & Hagos, T. (2023). Out-of-pocket health expenditure and associated factors among patients with hypertension in Debre-Tabor Comphrensive Specialized Hospital, South Gondar Zone, Northwest Ethiopia, 2020. *Frontiers in Public Health*, *11*.

Amaya-Lara J. L. (2016). Catastrophic expenditure due to out-of-pocket health payments and its determinants in Colombian households. *International Journal for Equity in Health*, *15*(1), 182.

Bedado, D., Kaso, A. W., & Hailu, A. (2022). Magnitude and determinants of out of pocket health expenditure among patients visiting outpatients in public hospitals in East Shoa Zone, Ethiopia. *Clinical Epidemiology and Global Health*, *15*, 101066.

Brinda, E. M., Andrés, R. A., & Enemark, U. (2014). Correlates of out-of-pocket and catastrophic health expenditures in Tanzania: results from a national household survey. *BMC International Health and Human Rights*, *14*, 5.

Brinda, E. M., Rajkumar, A. P., Enemark, U., Prince, M., & Jacob, K. S. (2012). Nature and determinants of out-of-pocket health expenditure among older people in a rural Indian community. *International Psychogeriatrics*, *24*(10), 1664–1673.

Buigut, S., Ettarh, R., & Amendah, D. D. (2015). Catastrophic health expenditure and its determinants in Kenya slum communities. *International Journal for Equity in Health*, *14*, 46.

Costa-Font, J., Kanavos, P., & Rovira, J. (2007). Determinants of out-of-pocket pharmaceutical expenditure and access to drugs in Catalonia. *Applied Economics*, *39*(5), 541–551.

da Silva, M. T., Barros, A. J., Bertoldi, A. D., de Andrade Jacinto, P., Matijasevich, A., Santos, I. S., & Tejada, C. A. (2015). Determinants of out-of-pocket health expenditure on children: an analysis of the 2004 Pelotas Birth Cohort. *International Journal for Equity in Health*, *14*, 53.

Datta, B. K., Husain, M. J., & Asma, S. (2019). Assessing the relationship between out-of-pocket spending on blood pressure and diabetes medication and household catastrophic health expenditure: evidence from Pakistan. *International Journal for Equity in Health*, *18*(1), 9.

Dorjdagva, J., Batbaatar, E., Svensson, M., Dorjsuren, B., & Kauhanen, J. (2016). Catastrophic health expenditure and impoverishment in Mongolia. *International Journal for Equity in Health*, *15*(1), 105.

Farahat, T. M., Shaheen, H. M., Khalil, N. A., Ibrahem, B. S. (2018). Out-of-pocket health expenditure in rural population. *Menoufia Medical Journal*, *31*(3), 846-849.

Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy*, *80*(2), 223-255.

Hailemichael, Y., Hanlon, C., Tirfessa, K., Docrat S., Alem A., Medhin G., … Hailemariam D. (2019). Catastrophic health expenditure and impoverishment in households of persons with depression: a cross-sectional, comparative study in rural Ethiopia. *BMC Public Health*, *19*, 930.

Khaing, I. K., Malik, A., Oo, M., & Hamajima, N. (2015). Health care expenditure of households in Magway, Myanmar. *Nagoya Journal of Medical Science*, *77*, 203–212.

Khalid, M., & Sattar, A. (2016). Households Study on Out-of-Pocket Health Expenditures in Pakistan. *Forman Journal of Economic Studies*, *12*, 75-88.

Kumara, A. S., & Samaratunge, R. (2016). Patterns and determinants of out-of-pocket health care expenditure in Sri Lanka: evidence from household surveys. *Health Policy and Planning*, *31*(8), 970–983.

Lee, H. Y., Oh, J., Minh, H. V., Moon, J. R., & Subramanian, S. V. (2019). Use of high-level health facilities and catastrophic expenditure in Vietnam: can health insurance moderate this relationship? *BMC Health Services Research*, *19*(1), 318.

Mamun, S. A. K., Khanam, R., & Rahman, M. M. (2018). The Determinants of Household Out-of-Pocket (OOP) Medical Expenditure in Rural Bangladesh. *Applied Health Economics and Health Policy*, *16*(2), 219–234.

Minh, H. V., Phuong, N. T. K., Saksena, P., James, C. D., & Xu, K. (2013). Financial burden of household out-of pocket health expenditure in Viet Nam: findings from the National Living Standard Survey 2002-2010. *Social Science & Medicine*, *96*, 258–263.

Molla, A. A., Chi, C., & Mondaca, A. L. (2017). Predictors of high out-of-pocket healthcare expenditure: an analysis using Bangladesh household income and expenditure survey, 2010. *BMC Health Services Research*, *17*(1), 94.

Mugisha, F., Kouyate, B., Gbangou, A., & Sauerborn, R. (2002). Examining out-of-pocket expenditure on health care in Nouna, Burkina Faso: implications for health policy. *Tropical Medicine & International Health*, *7*(2), 187–196.

Muhammad Malik, A., & Azam Syed, S. I. (2012). Socio-economic determinants of household out-of-pocket payments on healthcare in Pakistan. *International Journal for Equity in Health*, *11*(1), 51.

Njagi, P., Arsenijevic, J., & Groot, W. (2018). Understanding variations in catastrophic health expenditure, its underlying determinants and impoverishment in Sub-Saharan African countries: a scoping review. *Systematic Reviews*, *7*(1), 136.

Okello, N. O., & Njeru, A. (2015). Factors Affecting Out-Of-Pocket Medical Expenditure Among Out Patients in Hospitals in Nairobi County. *International Journal of Scientific and Research Publications*, *5*(6), 2250-3153.

Okunade, A. A., Suraratdecha, C., & Benson, D. A. (2010). Determinants of Thailand household healthcare expenditure: The relevance of permanent resources and other correlates. *Health Economics*, *19*(3), 365–376.

Oudmane, M., Mourji, F., & Ezzrari, A. (2019). The impact of out-of-pocket health expenditure on household impoverishment: Evidence from Morocco. *The International Journal of Health Planning and Management*, *34*(4), 1-17.

Pakistan Bureau of Statistics, G. (2020). *Household Integrated Economic Survey (HIES) 2018-19.*

Pakistan Bureau of Statistics, G. (2018). *National Health Accounts 2015-16.*

Pakistan Bureau of Statistics, G. (2022). *National Health Accounts 2019-20.*

Pal, R. (2010 February). *Analysing Catastrophic OOP Health Expenditure in India: Concepts, Determinants and Policy Implications* (Working Paper No. WP-2010-001). Indira Gandhi Institute of Development Research, Mumbai.

Pannarunothai, S., & Mills, A. (1997). The poor pay more: health-related inequality in Thailand. *Social Science & Medicine* (1982), *44*(12), 1781–1790.

Paul, A., Malick, S. C., Mondal, S., Lahiri, S. K. (2018). Exploring the determinants of catastrophic health expenditure and socioeconomic horizontal equity in relation to it: a rural community based longitudinal study in West Bengal. *International Journal for Equity in Health*, *5*(6), 2522-2528.

Rahman, M. Mahfuzur., Zhang, C., Swe, K. T., Rahman, M. S., Islam, M. R., Kamrujjaman, M., … Rahman, M. Mizanur. (2020). Disease-specific out-of-pocket healthcare expenditure in urban Bangladesh: A Bayesian analysis. *PLoS ONE*, *15*(1), e0227565.

Rehman, A., Shaikh, B. T., & Ronis, K. A. (2014). Health care seeking patterns and out of pocket payments for children under five years of age living in Katchi Abadis (slums), in Islamabad, Pakistan. *International Journal for Equity in Health*, *13*, 30.

Rous, J. J., & Hotchkiss, D. R. (2003). Estimation of the determinants of household health care expenditures in Nepal with controls for endogenous illness and provider choice. *Health Economics*, *12*(6), 431–451.

Rubin, R. M., & Koelln, K. (1993). Out-of-Pocket Health Expenditure Differentials Between Elderly and Non-Elderly Households. *The Gerontologist*, *33*(5), 595–602.

Sekyi, S., & Domanban, P. B. (2012). The Effects of Health Insurance on Outpatient Utilization and Healthcareexpenditure in Ghana. *International Journal of Humanities and Social Science*, 2(10), 40-49.

Sen, B., Rout, H. S. (2007). Determinants of Household Health Expenditure: Case of Urban Orissa. *Utkal Economic Papers*, *13*, 17–23.

World Health Organization. (2017). *World Health Statistics 2017: Monitoring Health for the SDGs, Sustainable Development Goals*.

World Health Organization. (2019). *World Health Statistics 2019: Monitoring Health for the SDGs, Sustainable Development Goals*.

Xu, K., Evans, D. B., Kawabata, K., Zeramdini, R., Klavus, J., & Murray, C. J. (2003). Household catastrophic health expenditure: a multicountry analysis. *The Lancet*, *362*, 111–117.

Xu, K., Saksena, P., & Holly, A. (2011 December). *The determinants of health expenditure: A country level panel data analysis*. Results for Development Institute.

Yardim, M. S., Cilingiroglu, N., & Yardim, N. (2010). Catastrophic health expenditure and impoverishment in Turkey. *Health Policy*, *94*(1), 26–33.

You, X., & Kobayashi, Y. (2011). Determinants of Out-of-Pocket Health Expenditure in China: Analysis Using China Health and Nutrition Survey Data. *Applied Health Economics and Health Policy*, *9*(1), 39–49

APPENDIX

Table A1:

Results of Pakistan- Overall and Urban-Rural Settings

APPENDIX

Table A1:

Results of Pakistan- Overall and Urban-Rural Settings

Dependent: OOP	Overall		Rural		Urban	
	Model		*Sub-Sample 1*		*Sub-Sample 2*	
Independent Variables	**Beta**	**Sig**	**Beta**	**Sig**	**Beta**	**Sig**
HH Expenditure	.030427	0	.0304319	0	.0303772	0
Under-5 Children	877.5881	0	878.4679	0	867.3958	0
65y or Above Elders	2653.805	0	2654.234	0	2642.038	0
HH Size	61.01735	0	60.91316	0	63.22367	0
Average HH Schooling	288.9416	0	288.7465	0	288.6243	0

Lighting Fuel	691.697	0	692.0428	0	728.7589	0
Cooking Fuel	-2058.57	0	-2059.691	0	-2041.909	0
Piped Water	-942.6708	0	-942.0367	0	-936.7148	0
Sanitation	-4906.587	0	-4907.477	0	-4898.246	0
Garbage	-414.6661	0	-452.828	0	-409.8563	0
Smoke Quantity	1.393464	0	1.39163	0	1.401101	0
_constant	-137.6436	0	-137.609	0	-188.5489	0
Observations	24748		15891		8857	
Model chi2	35700000	0	27500000	0	7895932.7	0
Goodness of fit (chi2)	24732.97	0.5042	15875.61	0.5061	8831.97	0.5370

Table A2:

Results of Rural Setting of Provinces

Dependent : OOP	KP		Punjab		Sindh		
	Sub-Sample 3		*Sub-Sample 4*		*Sub-Sample 5*		
Independent Variables	**Beta**	**Sig**	**Beta**	**Sig**	**Beta**	**Sig**	**Beta**
HH Expenditure	.0303674	0	.0304976	0	.0303663	0	.029849
Under-5 Children	860.9394	0	875.7332	0	876.9628	0	881.0382

65y or Above Elders	2646.926	0	2648.409	0	2654.395	0	2668.829
HH Size	68.41486	0	58.05587	0	61.81554	0	62.37787
Average HH Schooling	297.6826	0	288.2137	0	289.6099	0	245.3905
Lighting Fuel	676.4292	0	706.0808	0	694.5681	0	772.2756
Cooking Fuel	-2037.987	0	-2073.153	0	-2059.873	0	-1979.44
Piped Water	-959.4863	0	-943.9692	0	-958.4311	0	-778.889
Sanitation	-4912.355	0	-4902.494	0	-4880.947	0	-4738.79
Garbage	-584.6178	0	-448.0648	0	-555.1222	0	-1819.85
Smoke Quantity	1.396904	0	1.349599	0	1.393604	0	1.439121
_constant	-150.6519	0	-136.456	0	-132.4718	0	-130.666
Observations	3018		7809		3497		1567
Model chi2	1189052.9	0	14700000	0	7313406.48	0	176440.2
Goodness of fit (chi2)	3002.51	0.515	7791.03	0.5169	3483.99	0.502	1497.19

Dependent: OOP	KP		Punjab		Sindh		Baluchistan	
	Sub-Sample 7		*Sub-Sample 8*		*Sub-Sample 9*		*Sub-Sample 10*	
Independent Variables	Beta	Sig	Beta	Sig	Beta	Sig	Beta	Sig
HH Expenditure	0.0237708	0	0.0237	0	0.0238503	0	0.0232827	0
Under-5 Children	268.4715	0	240.5963	0	246.5654	0	231.7789	0
65y or Above Elders	6744.372	0	6822.006	0	6756.597	0	6535.386	0
HH Size	67.23922	0	50.47659	0	50.07166	0	65.45829	0.003
Average HH Schooling	209.5333	0	202.0646	0	199.9442	0	166.6908	0
Lighting Fuel	1346.229	0	1117.973	0	1153.853	0	1219.405	0
Cooking Fuel	507.3909	0	493.9815	0	499.6378	0	707.1999	0
Piped Water	-890.4142	0	-883.0648	0	-870.9697	0	-805.0481	0
Sanitation	-3492.222	0	-3640.591	0	-3661.616	0	-3460.66	0
Garbage	-2858.289	0	-2849.108	0	-2844.468	0	-2798.247	0
Smoke Quantity	1.385684	0	1.437752	0	1.447566	0	1.370195	0
_constant	-1020.156	0	-695.2751	0	-742.3578	0	-908.9857	0.009
Observations	1446		3938		2715		758	

Model chi2	1857719.3	0	3176338.36	0	2385499.05	0	25929.24	0
Goodness of fit (chi2)	1429.84	0.526	3921.82	0.5158	2697.95	0.524	737.17	0.584

Table A3:

Results of Urban Setting of Provinces

Behaviour Towards Climate Change – Intentions of The People of Karachi

* Shagufta Shabbar ** Siddiqua Alibhai

Abstract: In Pakistan, climate change is affecting agricultural output, increasing healthcare burden, causing havoc with lives, and damaging properties. Urban flooding has become a continuous issue. But are the people able to make a link between their actions and the impact it may have on causing climate change? Although some climate change mitigation strategies are being implemented by the government and various non-governmental organizations, they are far from being successful. Besides blaming the authorities little is being done by the people towards conservation, a major factor being the lack of interest in climate change. It is important to understand whether the general public recognizes the significance of mitigation strategies, and if so what actions, if any, are they taking. The current research uses primary cross-sectional data of 398 respondents collected using social media platforms in 2022, in order to find the intention of the public behind actions such as energy and water conservation and usage of cloth bags in place of plastic ones. Using logistic regression and qualitative analysis this paper investigates the level of awareness of the residents of Karachi in the context of climate change and their responsiveness regarding the need to take steps to reduce the adverse effects of climate change. The results show that the general behaviour of the people stems from their own preferences instead of concern for climate change, indicating the need for a deeper understanding of behavioural response towards climate change. This study calls for policy actions inducing behavioural change in the citizens, through green nudges.

Key words Climate change, energy conservation, intent-oriented, mitigation, recycling
JEL Classification Q53, Q54, Q38, Q25

1 Introduction

Studies on climate change in South East Asian region, reveal that local people do have an understanding that human activities, like cutting hills,

*PhD Scholar at IBA Karachi, sshabbar@iba.edu.pk

** Freelance Researcher siddiquaalibhai@gmail.com

deforestation and building infrastructures cause landslides (Ahmed, et al., 2022). However, opinions about the causes vary among the natives. Many believe human actions cause climate change, others recognize mitigation as a joint responsibility of the government to raise public awareness and citizens to show restraint by conserving resources like water and energy (Ahmed, & Atiqul Haq, 2019). The residents of Pakistan, are lacking insight on benefits and self-efficacy; there is a careless attitude towards gasoline use, energy and water consumption at household level, and recycling waste. The higher income and more educated strata are aware of the threats of climate change and are more likely to alter their behaviour and mitigate (Alvi, et al., 2020). Our objective to conduct research on the people of Karachi, their behaviour and intentions towards climate change, came from the gap existing in literature, as specifically the residents of Karachi were not found to be the subject of any study in the context of climate change. Awareness exists in varying degrees in Pakistan, we found literature on urban and rural women of Sindh[1], who are aware of climate change, however their awareness comes from secondary sources and their knowledge about hazards of climate change come from personal experience (Memon, et al., 2022). A study on urban, peri-urban and rural areas of Pakistan shows that the people are not equipped with the awareness of climate crisis nor do they possess knowledge of mitigation and adaptation strategies (Hussain, et al., 2018; and Hussain, et al., 2020). And even if they do have knowledge and may demonstrate the intention, they do not translate it into actual behaviour (Nguyen, Nguyen, & Hoang, 2019; Ceglia, de Oliveira Lima, & Leocádio, 2015; and Hanss, Böhm, Doran, & Homburg, 2016).

More and more governments are making their citizens responsible for climate change at the household level. As lifestyle choice and choosing environment friendly conduct by individuals will bring forth benefits collectively (Kent, 2012). People with more concern for the environment

---

[1] Sindh is a province in Pakistan, Karachi is a megalopolis of Sindh

are more likely to practice energy conservation, for instance by consuming energy-efficient light bulbs and other appliances. However, the study of 9 OECD countries shows that motivation to adapt is low when energy-saving investments are of higher costs, and more time consuming in acquiring and implementing (Urban and Scasny, 2012; and Elahi, Khalid, & Zhang, 2022). The higher cost of the product deters people unless they are fully aware of the benefits of the product (Trivedi, Patel, & Acharya, 2018; and Taghikhah, Voinov, & Shukla, 2019). The intention to purchase environment friendly products also depends on demographic variables such as age, gender, income and education (Shuai, Ding, Zhang, Guo, & Shuai, 2014; and Wang, Shen, Springer, & Hou, 2021). It additionally depends on easy and sufficient availability of environmental friendly products (Bonini, & Oppenheim, 2008; and Peattie, 2010).

Individuals do not like to consider their own lifestyles as the cause of climate change; it is much easier for them to blame other industrialised economies for contaminating the earth. Recent research reveals that developed countries too are struggling to make their citizens conscious of the threat climate change poses globally. In order to promote sustainable living, individuals, households, neighbourhoods and community level engagement is needed. It is imperative that all stakeholders opt for both mitigation (reduction of emissions from energy use) and adaptation to environment-friendly lifestyles to avoid the threats climate change poses (IPCC, 2007). Factual information on climate change must be communicated in a manner where the message hits home (Jang, 2013). Simultaneously more and complete information should be provided to the consumers regarding the environmental impact of their actions (Li, Long, & Chen, 2017). Likewise, green product awareness should be increased through concentrated efforts (Sreen, Purbey, & Sadarangani, 2018).

In a society like Pakistan, the role of women and children and that of the marginalized groups must be recognized as they are the potential agents of

change. Making them knowledgeable about the threats of climate change will create a society that will consciously adapt its lifestyle to mitigate GHG emission. Adaptation comes from learning-by-doing (Salman, et al., 2018). Therefore, an all-inclusive view and approach is required to understand Pro-Environmental Behaviours (PEBs) in order to change to a low-carbon society. At a national level, industrial and commercial sectors must have the pro-environmental attitude and at the individual level, people must make a pro-environmental choice. The main reason to adopt or not to adopt PEBs is the cost. Saving, followed by habit and convenience motivate people to switch to PEB. In some economies, rules and regulations are in place thus it is incumbent to follow PEBs, yet in other societies moral values (no wastage of resources) enforce PEBs (Lee, et al., 2013). People in general display more pro-social behaviour when in public. The reason is that being visible to others makes one conscious about being judged; it is the reverse of the Bystander Effect. [2]Actions like displaying a reusable grocery bag motivate the pro-environment actors as it is sending a positive signal to the valued environment friendly group, thus reinforcing responsible behaviour "green to be seen". Thus the social influence shapes green intentions of the people (Wu, & Chen, 2014; and Choi, & Johnson, 2019).

Low carbon lifestyles encompass reduce, reuse and recycle. It includes avoiding or reducing driving and flying, red meat and dairy consumption, material and energy consumption. Low carbon lifestyle means adopting low-carbon and climate-resilient technologies e.g. installing insulation; support for large-scale low-carbon infrastructures e.g., wind farms etc., (Whitmarsh, et al., 2021). Low-carbon lifestyle change will impact tourism as well. Holiday destinations, the transportation system at these tourist locations will cause geographic and seasonal shifts in tourism demand, whereby demand may increase or decrease of specific tourism markets

---

[2] Bystanders will come forward to help if they know they are being watched or there is a CCTV camera around.

(Gössling, et al., 2012). Society and science have to work together to ensure the dangers of climate change are understood by all citizens. The two cardinal rules to be followed are, first the rights of the entire global community must be of concern, which is inclusive of developing nations and especially poor nations and second is to ensure sustainable development for future generations (Change, et al., 2006).

Denial of climate change or ignoring the magnitude of grave environmental problems occurring due to climate change, will lead to the breakdown of ecosystems that the earth relies on. Global warming is already creating havoc to the environment, the need of the hour is to acknowledge the situation and work towards securing our future. Ian Lowe, (in his review of Haydn Washington's book, *Climate change denial: Heads in the sand*) says, "*Climate change denial is the biggest single obstacle to achieving a sustainable futu*re". Policy makers, scientists and citizens must be on board to reduce the damage caused by climate change. The proverbial head in the sand where climate change is concerned, does not make our habitat any less vulnerable from the effects of the crisis we are facing. Behaviour change, individual as well as societal, is central to reducing emissions. Collectively, lifestyles will have to change if mitigation is to be achieved. Reducing the effects of climate change not only requires changes in consumer behaviour but communities and organisations have to come forward and play their part. Especially those in positions of political power can impact policies.

Environmentally concerned citizens are divided on how to tackle climate change, some are advocates of individual behaviour change while others advocate collective social action as they blame social structures for causing climate change (Kenis, & Mathijs, 2012). Policy makers are relying on behaviour change regardless of huge investments in clean/renewable energy to reduce carbon emissions. As behaviour change will translate into mitigation. Social media plays a great role in influencing responsible behaviour by promoting low carbon lifestyles (Piccolo, & Alani, 2015).

Creating awareness about the adverse effects of climate change can improve attitudes and behaviour towards mitigation and adaptation. According to IPCC, developing and poor countries are more vulnerable to climate change, and have lower levels of understanding environmental issues as per PEW Global's 2006 research (Masud Al-Amin et al., 2016).

Pakistan's National Climate Change Policy of 2012 and its subsequent updated versions clearly states its intention to conserve energy. In Karachi, K-Electric (electricity distributor) in an attempt to tackle the problem of short supply of electricity started a media campaign of making citizens responsible for energy conservation. But did it have the desired impact? Similarly, the government in an attempt to reduce the consumption of plastic, started a drive in 2021 to decrease usage of plastic. Cloth bags were encouraged but did that change the habits of the citizens? Karachi lacks fresh water supply in most of the areas. Fresh water supply uses energy for processing. There are many times when there is no supply and households resort to buying water from 'Tanker Mafia'[3]. But what are the households doing to conserve water consumption. Are there any specific steps being taken to conserve resources or does the government need to create a more impactful awareness campaign to make the citizens more responsible? These are important questions that this study aims to answer.

This paper seeks to understand the actual meaning behind the actions taken by the people which may result in having an impact on the climate. Intent oriented behaviour is taken here as being the cause behind the action taken which can in turn impact the climate (Stern, 2000; Whitmarsh, 2009). Altruistic people are motivated to demonstrate actions that are environmentally intent oriented (Stern, 2000). Stern describes attitudes and values as important factors influencing environmentally-significant behaviour. The older age group are more likely to adopt environment

---

[3] Tanker mafia is a term used to illegal selling of fresh water to households that lack a consistent water supply

friendly actions (Cheng, et al., 2017). Further, the fear of health hazards makes people implement protective measures. Knowledge about climate change and global warming increases the risk perception and people act in self-interest to protect themselves. Since the threat of climate change is portrayed as a global issue, implying that it is more of an external shock, therefore it becomes convenient to blame other countries around the world and their GHG emissions as factors contributing to climate change. Thus the local people absolves themselves to a certain extent and considers their small steps taken towards mitigation as insignificant and as the best they can do (Sharples, 2010).

The contribution to literature in this study is two folds. First, the research in this paper investigates the actions taken by the residents of the city of Karachi and tries to discern if they are taken 'out of concern for climate change' or are 'energy conservation practices'. Thus the aim of this research is to firstly gauge the level of awareness about climate change amongst the population of Karachi, how conscious are households of their own carbon footprint, and what measures are being taken at individual level to become more environment friendly. Hence measuring their values and moral obligation and assessing their association with behaviour that has a significant impact on the environment. To understand this the variables used are described in detail in the data section. Secondly, our study intends to learn whether the citizens connect mitigating the negative effects of climate change at individual level with better quality of air to breathe, better health and general wellbeing. To the best of our knowledge there is no study in the context of Pakistan that has made an attempt to understand these dimensions and thus our study aims to fill this gap in literature. For this purpose, primary data was collected via online survey, the link was shared to school, college and university students, homemakers, and people in the workforce on various social media platforms, who in turn were requested to share the link to the survey with their contacts. The aim was to collect data by snowballing technique. More on this in the data section. With

pervasive digital connectivity and with the Theory of Six degrees of Separation in place, we collected data from as many respondents as consented and were willing. The current study draws from the detailed theoretical foundations provided in Wang, Shen, Springer, & Hou, (2021). The comparison provided of the most popular theories is provided in figure A1 given in the appendix.

2 Contextual Background

Climate change is threatening our ecosystem on earth. Sustainable development goals (SDGs) are designed to encourage stakeholders to take appropriate actions to conserve the planet. Human activities such as manufacturing, energy producing coal-powered plants, fossil fuels etc., are causing a rise in the earth's temperature annually, adversely impacting agriculture, water resources, forests, biodiversity, health, coastal management and causing extreme temperatures leading to melting of glaciers. WWF (New Zealand) states that the main cause of climate change is due to "increased use of fossil fuels". The Intergovernmental Panel on Climate Change (IPCC, the UN Environment Program's climate body) states that there are various evidences to confirm that the planet is slowly warming. This change in the climate has caused not only increased sea levels and melted glaciers but also caused drastic changes in the Earth's climate patterns. At international level IPCC aims to motivate people to help decrease carbon pollution by 2050 to zero.

Pakistan has been having its own share of constantly increasing environmental challenges (Pakistan Economic Survey, 2021-2022). Study by Mani et al. (2018) reveals that the Pakistan's average temperature is already higher than the optimal level required for maximum consumption; further increase in temperatures will negatively impact labour productivity thereby decreasing standard of living. Climate change affects living standards as there is a negative correlation between consumption and rising temperatures. CO_2 emissions from fuel combustion are the largest

contributors of Greenhouse gas (GHG) emissions. GHG emissions in Pakistan have been on the rise since 2015. Sector-wise breakdown of total GHG emissions in 2019 is, Industrial sector 32%, Transport 28%, Electricity 27%, Building sector 11% and Other Energy-related sectors 2% (Climate Transparency Report, 2020).[4] Breakdown of electricity production from various sources in 2015, is given as, oil 37.2%, gas and coal 25.9%, hydroelectric sources 30.7 %, renewable sources 0.8% (excluding hydroelectric), Nuclear sources 4.8% (World Bank Data).

In a span of around four decades, Pakistan has seen an increase in annual mean temperature of 0.9 degrees (World Bank, 2021).[5] Figures for mean monthly temperatures and average monthly rainfall for Pakistan are presented in figures A3 and A4 in the appendix. The data of the last three decades show that there has been increase in temperature and rainfall no longer follows a seasonal pattern. There has also been a significant surge in the number and intensity of heat waves in the province (sub-national) of Sindh where Karachi is located. Figure 1 shows the data of six decades and indicates that the mean temperature has increased over the years in the Sindh province. Climate Risk Country Profile: Pakistan (2021), notes that the rise in daily maximum temperature is more pronounced than the mean temperature increase. It is seen that at high temperatures consumption, as indicator of living standards, decreases. Due to this challenges like health issues, undernourishment and poverty will continue to rise, affecting all provinces with Sindh being most vulnerable (Mani, et al., 2018). The sixty years' data in figure 2 also shows erratic behaviour and a notable increase in the level of precipitation. Thus further indicating that Pakistan and specifically Sindh are being significantly affected by climate change.
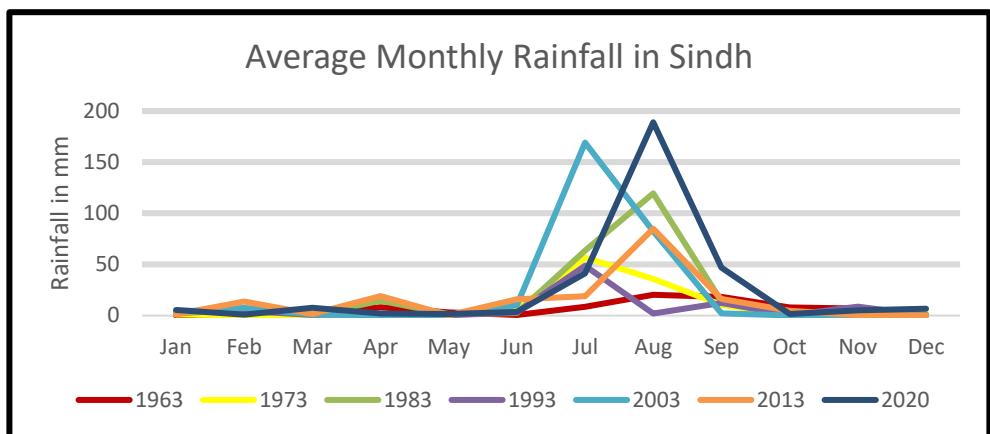*Figure 1*

---

[4] For GHG emissions in Pakistan compared to SAARC countries please see appendix figure A2
[5] Climate Change Knowledge Portal for Development Practitioners and Policy Makers
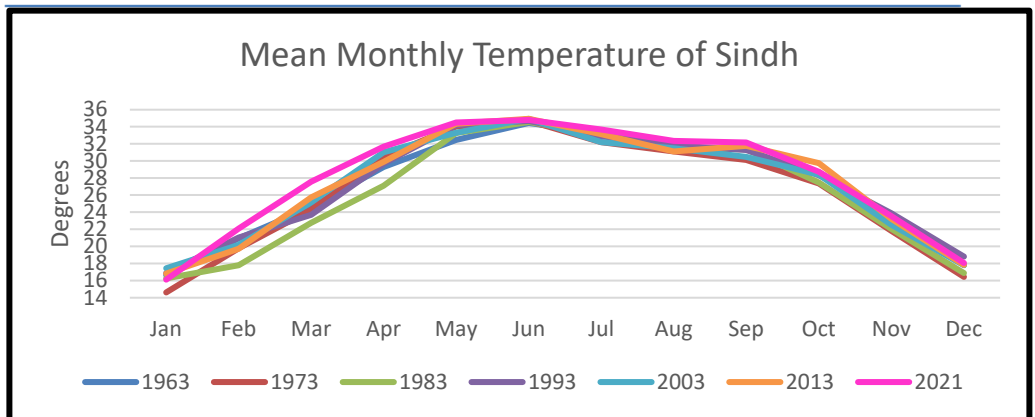
Mean Monthly Temperature of Sindh

Figure 2

Average Monthly Rainfall in Sindh

Energy consumption is used as an indicator by policy makers and research scientists to see if the general public is pursuing the climate change mitigation strategies (Whitmarsh, 2009). It has been observed that energy consumption has increased globally. In terms of Pakistan there is a noticeable steep rise in this consumption. In 2021, Pakistan's Electricity

Consumption rose to a total of 116,816.0 GWh as compared to 108,371.0 GWh in 2020, as reported by the Ministry of Finance of Pakistan. Fossil fuel consumption through coal, rose to 4,875,302.0 Ton of Oil Equivalent (TOE) in 2020 from 2,640,347.0 TOE in 2019. Electricity Consumption in Sindh in 2020 was 20,876.0 GWh. In Karachi, the huge surge in energy demand has mostly been catered by non-renewable energy sources (Civil Society Coalition for Climate Change (CSCCC)).[6] Around 70% of the demand is met by use of natural gas and 28% from oil. Only 8% of the Sindh area has some form of forest resources. Climate change has increased natural disasters including floods (flash floods due to intense monsoon rainfall and melting glaciers); and heat waves. Additionally, there is lack of fresh water supply due to poor water infrastructure in the quickly expanding city of Karachi. Therefore, fresh water scarcity and insufficient supply of energy are the two most serious issues being faced by the citizens. Karachi, as a metropolis of Pakistan, bears burden of being overpopulated and thus is not only susceptible to climate change but also lacks resources to meet the basic needs of half its population! The heat waves and floods that Karachi has endured in the recent few years are evidence of environmental breakdown of the city. Therefore, it is important to understand whether the behaviour of the people is such that it has a significant impact on the environment (Stern, 2000).

3 Data and methodology

The focus of the study is Karachi which is the largest city of Pakistan both in terms of area and population. With a population at 14,916,456 (2017 census), it is estimated to have increased to 16.8 million in 2022. This megacity is also the provincial capital and is an economic magnet. According to estimates of United Nations-World Population Prospects, it continues to grow at around 2.5% annually. The increased pressure on the

---

[6] Pakistan Climate Change portal (CSCCC)

city's limited resources and infrastructure has made it a centre of heated discussion as it increasingly faces the brunt of climate change in terms of urban flooding and heat waves. Karachi serves to be an ideal setup for understanding the attitudes of its diverse demographics.

This survey uses primary level cross-sectional data which is both quantitative and qualitative in order to better understand the behavioural responses towards climate change and the intentions behind the actions taken by the people such as energy and water conservation and usage of cloth bags in place of plastic ones. Before the start of the survey, a pilot was conducted on 25 people. In total data was collected from 450 respondents but due to some responses not meeting the set criteria, they were rejected. The current research uses data of 398 respondents. The data collection period was from March to May 2022. An exponential non-discriminative snowball sampling method is used to fill questionnaires in an internet-based survey. Although it has the disadvantage that it 'increases the likelihood that the sample is not representative of the population' (Fricker, 2008); it is cost effective and respondents can answer questions at their convenience. The respondents are able to give better thought out answers and since the sharing of identity is not mandatory, they are more willing to share correct information. At the start of the survey their consent was taken to use their response for the purpose of our study. It was assured that their identities will not be made public.

There were 37 questions in total. Except two, all questions were closed-ended. These open-ended questions are "List two actions you usually take to conserve energy at home" and "In your opinion, whose responsibility is it to control climate change?" In order to analyse these qualitative questions, we used the qualitative software NVivo. This software did a thematic coding of the responses, which were then merged with the other quantitative data for analysis. The closed-ended questions were fixed-response ones. For example, "Do you turn off lights that you are not using?" If the response was yes, then the next question asked the respondent to

choose from the options given. These options were: convenience, to save money, habit, moral obligation, to reduce the heat in the atmosphere, or to save energy. The survey included specific questions to understand the intent behind the actions undertaken. For example, "Have you taken any specific action to mitigate the impact of climate change e.g. energy conservation?" If the response was yes, then the respondent was asked the open-ended question mentioned earlier which required listing of actions taken.

Further the surveyed were asked about their habits regarding usage of appliances and their reasons for switching off the air conditioner (AC) or heater; and do they feel that their measures taken at the individual level for example, of choosing to walk short distance instead of taking the car or keeping the AC thermostat at 22°C or above are helping the environment. As many as 95.2% of the respondents believed that climate change is real. But surprisingly only 35.9% of the respondents showed that they were satisfied with their own efforts to reduce climate change by engaging in any one of the mentioned activities. The results are shown in figure 3 below.

Figure 3: Satisfied as a citizen with habits to reduce carbon footprint, pollution, conserving water and energy
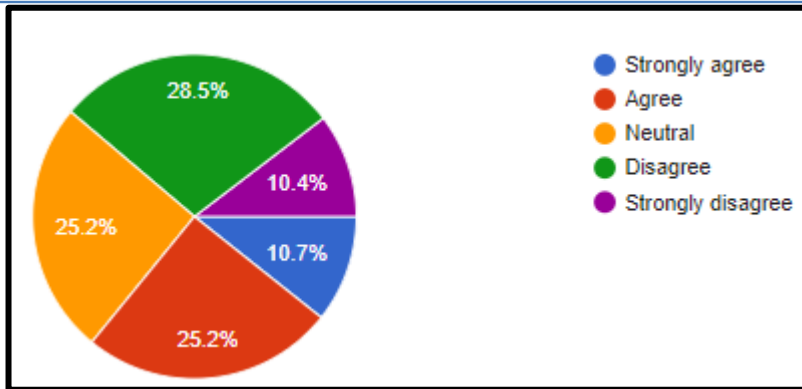
Source: Authors' own estimation (2022)

The data collected reflected the response from people belonging to various socio-economic groups; however, due to the design of the survey it was not possible to collect responses from the people who belong to the very lower spectrum of income group. Also a large number of respondents were university students. Since university students may be considered more aware of climate change it is expected that this may have given a biased result. Thus the results of this study must be taken with some reservations. 22.4% of the respondents were above 45 years old. Demographic details are given in table 1.

Table 1: Demographic profile of respondents

		Percentage of total
Gender	Male	42.7
	Female	55.8
	Prefer not to say	1.5
Age	18-24	48
	25-34	13.6
	35-44	11.8
	45-54	16.3
	55-64	6.3
	Above 64	3.8
Household Income	Up to Rs. 50,000	8.8
	Rs.51,000 - Rs100,000	18.4

	Rs. 101,000 - Rs. 150,00	17.6
	Rs.151,000 - Rs.200,000	19.9
	Above 200,000	35.3
Household size	1-2	3
	2-3	0.3
	3-4	29.4
	4-5	0.5
	5-6	45.5
	6-7	0
	7-8	12.6
	More than 8	8.8

Source: Authors' own estimation (2022)

Response to question regarding causes of climate change was used as a covariate. The survey also asked questions to determine the demographic profile of the respondent. These included questions related to gender, age, total household income, education of respondent, area of residence in the city and household size. We classify the variable 'area of residence' as part of any of the seven districts of Karachi. The respondents were also required to share if they believed climate change was a real threat or not and this was used as a control variable. The other relevant independent variables are opinions asked regarding 1) whose responsibility it is to mitigate climate change, 2) being affected by torrential rains of 2020 and heat wave of 2015, and 3) having suffered due to lack of fresh water supply and air pollution. The last two variables are binary in nature. Two regressions are run, one for each of the two dependent variables. The dependent variables include a) buying energy savers; and b) using cloth bag for shopping.

The third variable of interest for this study is conserving water. The reason for having conserving water as a variable is because the provision of fresh water requires energy. Water treatment, filter and pumping increases the carbon footprint and wastage leaves less for the ecosystem. Understanding the context and dynamics of the city where the survey was conducted is important to link it with the behaviour of the people. The city has been suffering with lack of fresh water supply in all its districts. Therefore, when

the survey asked if they conserve water each respondent stated in affirmation that they do so. Consequently, the analysis in the current study made an attempt to understand how the respondents conserve water and what they do when they face water shortages.

Due to the nominal nature of the first two dependent variables, logistic regression is used. For the second regression multinomial logistic regression is used since it has more than two categories whereas in the first one binomial logistic is used.[7] This is done following the methods adopted by Saguye, (2016); and Marie, Yirga, Haile, & Tquabo, (2020). For dichotomous outcome linear probability model and probit model can also be used. However, the disturbance term in the linear probability model does not have a normal distribution. This makes statistical inferences questionable. Additionally, the estimators are inefficient due to the heteroscedasticity issue in the error term. Another reason why linear probability model is not suitable is because in the absence of restrictions on the beta coefficients, the probabilities do not fall in the distribution. Probit model can also be used and the cumulative distribution function gives a sigmoid distribution. Probit model uses Maximum Likelihood Estimation instead of OLS, like the Logit model. But the logit model ensures that the probability stays in the limit of 0 and 1. Due to the weakness in the linear probability model and probit model, the logit model is used here. The functional form of logit model is selected using the specifications given in Gujrati and Porter (2003) in the context of climate change.

Logistic regression allows independent variables to be nominal and/or continuous. One of the assumptions of this regression is that dependent variable should have exhaustive categories. The logit model is specified as:

---

[7] Other studies that have used this estimation strategy in climate change context are Ahmed, Ahmed, Chowdhury, & Atiqul Haq, (2022); Ahmed, Alam, Ahmed, Ambinakudige, Almazroui, Islam, ... & Mahmud, (2022); and Ahmed, & Atiqul Haq, (2019).

$$Logit\ (P) = \log(\frac{P}{1 - P})$$

$$P_i = \Pr(\frac{Y = 1}{X = x_i})$$

$$\Pr\left(y = \frac{1}{x}\right) = \frac{exp^x}{1 + e^x}$$

$$= \log\left(\frac{P_i}{1 - P_i}\right) = Logit\ (P_i) = \beta_0 + \beta_1 X_1 + \cdots + \beta_n X_n$$

$$+ e$$

$$\frac{P_i}{1 - P_i} = \exp(\beta_0 + \beta_i X_i)$$

Where the ratio of $(\frac{P_i}{1-P_i})$ is the probability of using anyone of the strategies. The βs are the parameters to be estimated, the Xs are the independent variables and the e is the error term. Details of all the dependent and independent variables are given in the next section. The independent variables are analysed to check for statistical issues. Absence of multicollinearity between the independent variables is checked which is also an assumption required for logistic regression. If the explanatory variables are highly correlated with each other than they do not provide any unique information in the regression model and can cause problems while fitting the model. It is done by the variance inflation factor (VIF). The correlation matrix checks the degree of collinearity between the variables and the variables are considered collinear if the coefficient correlation matrix is greater than 0.5. A value lower than this indicates absence of multicollinearity. A value of 1 indicates perfect collinearity. The correlation matrices for the variables used in the two logit estimations are given in appendix table A1 and A2.

4 Results

The regression results for energy conservation at home gauged through the usage of energy efficient bulbs is shown in table 2. The reference category is not buying energy efficient bulbs. The McFadden pseudo R-square shows that the full model represents a 9.4% improvement in fit in contrast to the null model. Since it is a logistic regression, the coefficients cannot be interpreted. Most of the control variables were found to be insignificant. That was quite a surprising result. It indicated that people's behaviour to use energy savers is not dependent on their gender, income, age, area of residence in Karachi and household size. The two variables that were found to be significant are the level of education and experience of heat wave. To further understand the reasons behind buying the energy efficient bulbs the respondents were asked to choose from given options. The findings are shown in table 6 and discussed that the main reason for buying energy efficient bulbs is to save money.

Table 2: Regression results related to energy conservation

Dependent variable: Do you buy energy efficient light bulbs?	**Prob>chi-square = 0.02** **Pseudo R2 = 0.17**
Independent Variables	Coefficient
Gender	0.33 (0.61)
District	0.20 (1.05)
Age	0.18 (0.61)
Education	1.1** (2.21)
Household size	0.03 (0.17)
Household income	0.07 (0.34)
Think climate change is real	0.04 (0.07)
Taken any specific action to mitigate the impact of climate change	0.45 (1.29)

Satisfied as a citizen with your habits to reduce carbon footprint, and energy use	0.17 (0.66)
Reasons to turn off extra lights	0.07 (0.29)
Participation in campaigns about climate change	0.25 (0.66)
Suffered from heat waves	1.30** (2.19)

Note: Figures in parenthesis indicates the value of z-statistics.
Significance levels: * $p < .01$, ** $p < .05$, *** $p < .1$.
Source: Authors' own estimation

Although 94.2% of the people stated that they believed that climate change is real and 4.8% showed uncertainty; 29.1% of the people believed that it is solely the government's responsibility to carry out climate change mitigation strategies. 56.3% of the respondents stated that it is both the government's and the individual's responsibility to adopt specific mitigation strategies. When asked if *they have taken any specific action to mitigate the impact of climate change,* only 43.7 % respondent said yes. Others either said no or showed uncertainty regarding their action. This indicates that most of the people believe that they are indeed being responsible citizens. However, when asked if they were satisfied as a citizen with their habits to reduce carbon footprint; pollution; and conserving water and energy, 34.8% agreed. This shows that people understand and realize that they are not taking sufficient actions towards mitigating climate change.

There was another question to better understand the behaviour of the people and this question asked *do you feel you are doing your level best to protect the environment and lessen the effects of climate change?* The response for this question showed that only 38.8% said that they were indeed putting in an effort.

Pakistan being a developing country does not have a proper recycling mechanism in place. There is no concept of sorting trash by the households

before discarding in the garbage. This sorting of garbage and then selling the garbage for recycling is done by untrained individuals who do this on their own accord with the sole purpose of earning cash. Thus there is no organized sector for recycling. And in connection to this there is no formal market for selling recycled products, like in the developed countries. Thus there is no concept by households to buy recycled products. However due to lack of resources people have the habit of reusing disposable items such as one-time use plastic bottles, which may in fact be detrimental to their health. In connection to this the respondents were asked if *they intentionally use/ purchase recycled items (such as recycled paper bags/cards/envelopes)*. Only 34.6% said that they do so. This indicates that even if they are using the recycled products, it is not due to concern for climate change. Out of the people that said that they recycle/upcycle products, 41.2% said that they do so in order to be environmentally friendly. A smaller number mentioned the reason behind this action so as to save money. Details are shown in table 4.

Further the question regarding plastic bag usage also shows little concern for the environment. Only 22.1% of the people make the additional effort of carrying cloth bag for shopping. While 27.1% said that they do not carry cloth bag for shopping, an additional 14.5% reported that they do not stop the shop keeper when the shop keeper hands their grocery in plastic bags. This shows that people are generally more inclined towards their own convenience. Multinomial logistic regression results for using cloth bags out of concern for climate change are shown in table 3. The reference category is not using cloth bag. The chi-square test shows that it is significant. The McFadden pseudo R-square shows that the full model represents a 9.4% improvement in fit in contrast to the null model.

Table 3: Regression results related to using cloth bags out of concern for climate change

Dependent variable: Using cloth bag for shopping Base outcome = 0	Prob>chi-square = 0.00

	Pseudo R2 = 0.09	
Independent Variables	**Coefficient Comparison group 1**	**Coefficient Comparison group 2**
Gender	0.92* (3.27)	0.83* (3.10)
District	0.17** (2.24)	0.10 (1.27)
Age	0.12 (1.11)	0.11 (1.02)
Education	0.05 (0.27)	0.12 (0.70)
Household size	0.08 (1.04)	0.05 (0.64)
Household income	0.02 (0.23)	0.16 (1.50)
Think climate change is real	0.12 (0.36)	0.21 (0.69)
Taken any specific action to mitigate the impact of climate change	0.03 (0.18)	0.04 (0.25)
Satisfied as a citizen with your habits to reduce carbon footprint, and energy use	0.19 (1.52)	0.14 (1.12)
Participation in campaigns about climate change	0.35** (1.77)	0.20 (1.13)
Intentionally use/ purchase recycled items	0.05 (0.32)	0.27** (1.68)
Recycle/ upcycle (creative reuse of) items	0.67** (2.05)	0.68** (2.18)
Taken part in planting of trees around neighbourhood	0.55** (1.96)	0.61* (2.29)
Pollution has affected health	0.09 (0.50)	0.02 (0.18)
Feel irritated due to pollution	0.10 (0.56)	0.25 (1.28)
Constant	3.49 (2.92)	1.49 (1.28)

Note: Figures in parenthesis indicates the value of z-statistics.
Significance levels: * $p < .01$, ** $p < .05$, *** $p < .1$.
Source: Authors' own estimation

There is a significant association between usage of cloth bags and those who have been involved in campaigning for climate change and planting of

trees. The association is not significant for those who have been effected by pollution, who believe that climate change is real, household size, household income and education. The results indicate that those people who recycle or upcycle items are inclined to use cloth bags. This shows that the demographic variables do not significantly impact the behaviour towards taking actions to counter climate change. Rather the behaviour stems from other factors such as previous exposure to climate change issues and having an understanding of the importance of conserving resources and reducing wastage.

In the survey 40% responded that *they have at least once taken part in a campaign about an environmental issue.* Additionally, 40% of the respondents were directly affected by the heavy rains in August, 2020; and 42% have experienced the heat waves in Karachi. Heat waves have become specially frequent and intense after 2015. One of the questions encouraged them to think back to the year of 2015 when the city had the worst form of heat wave during the summers. The respondents recalled and 21.78% mentioned that they suffered immensely during that heatwave. There were three responses that even revealed having lost a close friend / family member due to the heat wave in 2015. Even though the respondents were impacted by these two major calamities due to climate change, the data shows that many did not make efforts to tackle the issue. For example, only half of the respondents stated that they have ever planted a tree. This is surprising when 95% respondent that their health has been impacted adversely due to air pollution in Karachi. 95.1% feel irritated by it. It is also more surprising when only 17.1% said that they prefer walking short distance instead of using a vehicle due to it being more environmentally friendly. More details on the reason for them walking over short distances is shown in table 4 below. This leads to some very important insights. Even though people feel the impacts of climate change, their behaviour is not motivated by a concern out of climate change.

The air conditioner consumes around 3000 to 5000 watts of electricity per hour. The lower the temperature setting, the more power is used. This increases GHG emissions in the form of hydrofluorocarbons (HFCs). Although newer versions of air conditioners now use HFCs (which is considered better than halons and chlorofluorocarbons which were used in older versions, contributing to the depletion of Earth's ozone layer). Keeping this information in mind, people were asked their preferred temperature setting of the air-conditioner, as lower settings demand more energy. The electricity distribution company of Karachi is K-Electric and it regularly advertises and encourages people to keep the setting of air-conditioners above 24 degrees. Yet 81.45% of the respondents stated that they keep the setting below 25 degrees. Further even if they are choosing a higher setting their main reason for choosing so is to save money and not out of concern for climate change. This is shown in table 4.

Table 4: Intentions behind actions

Actions taken by HH	Reasons for action (% of total respondents)							
	To be environment-friendly	Convenience	Save money	Health related	Habit	Moral obligation	Other reason	N.A./ I do not
A.C. temperature preference	17.7	19.3	38.9 *	7.7	12.5	1.9	--	1.9
Turning off extra lightings	3.5	1.3	51.3 *	0	20.9	22.9	0.3	--
Buy energy saver bulbs	0	2.9	81.3 *	--	0.7	2.2	8.6	4.2
Recycling/ upcycling	41.2*	7.9	12.9	0	8.2	3.4	0.8	25.6
Prefer walking over short distances	17.1	28.4*	5.7	17.1	17.3	1.3	1.8	11.4

Source: Authors' own estimation
*Note: * Most popular opinion*

Respondents were also inquired about their usage of heaters. But since Karachi is not a city with extreme winters, more than 70% said that they do not even own a heater. Out of those that do own the heater, only 1.7% said that they leave the heater running when they leave the room for a short while. Another interesting insight that we got from the survey was this that although only 1.3% mentioned that they do not turn off the lights that are not being currently used, 51.3% of the people mentioned their intention of switching off the lights is to save money. Only 3.5% said that they turn the lights off because they want to be environmentally friendly. It could be a possibility that the frequent encouragement by the K-electric had some impact on the people and therefore 22.9% of the people said that it is their moral obligation to save electricity and that is the reason that they turn off extra lights. Similarly, when inquired about their main reason to purchasing energy savers, they mentioned that it is in order to save money. Thus saving money seems to be the main reason for the actions taken by the people and these actions do not stem from out of concern for climate change.

Fresh water supply uses up energy and thus causing an increase in the carbon footprint. Conserving water can reduce this footprint. The city of Karachi is often faced with shortages of fresh water supply for the households. When inquired about lack of fresh water supply in the households, 97% showed that they feel extremely frustrated with this recurring issue; 71.2% resort to using tankers while 22.5% use the untreated well water. Further they were inquired about the specific actions they take to conserve water usage even when there is no water shortage. The most popular action is to turn the tap off while brushing teeth. However, other practices that can conserve water such as using a bucket for shower or using washing machines for full loads are not followed by the majority of the people. The responses related to washing machine and shower are concerning as both activities waste a lot of fresh water. Actions such as checking for water leakage requires additional effort is also done less frequently. Table 5 shows that only 3.3% of the respondents make an effort

to reuse the water for example the water left after washing vegetables. This indicates that they do not want to make an extra effort or go out of their way to conserve water. Only in dire circumstances when there is no water coming from the pipeline and water needs to be purchased from other sources, then the people conserve water properly.

Table 5: Water conservation

Actions taken to conserve water at home	Yes
Check toilet for leaks	66.89%
Turn off the water while brushing teeth	90.03%
Use bucket for shower	37.75%
Use automatic washing machine only for full loads	35.76%
When washing dishes, don't leave the water running for rinsing	73.84%
other(reuse water/ use aerorated shower)	3.31%

Source: Authors' own estimation

5 Discussion

The current study shows that 29.1% of the people believe that it is solely the government's responsibility to carry out climate change mitigation strategies while 56.3% of the respondents stated that it is both the government's and the individual's responsibility to adopt specific mitigation strategies. These findings support findings of previous studies such as Ahmed, & Atiqul Haq, (2019) which show that people expect the government to shoulder more responsibility towards climate change mitigation strategies. The current study shows that even though the respondents were impacted by two major climate change related calamities in the past decade, many did not make significant efforts. A probable reason being that they consider their actions small and believe that they cannot make a difference. Our study also indicates that most of the people have the perception that they are being responsible citizens and that they realize that their actions are not sufficient to mitigate climate change. They

believe that they need to change their behaviour and play a more active role. This is important to consider as people who believe in the urgency of responding to climate change are the ones who would undertake specific actions to mitigate the impacts (Bateman, & O'Connor, 2016; Mildenberger, et al., 2019).

Our findings show a significant association between usage of cloth bags and those who have been involved in campaigning for climate change and planting of trees. This shows that it is important to raise awareness and give green nudges on an ongoing basis. The role of teachers in this regard is especially important as discussed in Ahmed, et al., (2022) and also usage of social media. In a study in Bangladesh the results showed that 61% of the respondents agreed that there has been some change in the climate (Huda, 2013). And this awareness is dependent on other socio demographic characteristics (Hasan, & Akhter, 2011; Bayard, et al., 2007). In our study we found a strong relationship between awareness and the covariate for education; however, there was no association with other control variables such as the household size and household income.

Almost all the respondents in our study agreed that their health has been impacted adversely due to air pollution in Karachi and 95.1% feel extremely irritated by it. This is in line with another study in Bangladesh which shows that climate change has had adverse impact on health (Ahmed, & Atiqul Haq, 2019). But even though the people feel an adverse impact on their health, their behaviour is not motivated by a concern out of climate change. The findings of this study show that saving money seems to be the main reason for the actions taken by the people and these actions do not stem from out of concern for climate change. The results are in line with Whitmarsh, (2009) that people in Karachi are not taking actions such as energy conservation, recycling, decreasing plastic usage and water conservation due to a concern for climate change but mainly due to monetary concerns.

6 Concluding Remarks and Policy Implications

Pakistan is one of the ten most vulnerable nations suffering climate crisis. Frequency and intensity of rainfall have increased. Karachi's unplanned and unsystematic expansion has made it to the ten worst cities to live in, as per the Economist. The continuous increase in energy consumption along with invisible public mitigation efforts to control climate change, is a cause of serious concern. This study made an attempt to understand the intention behind the actions that people take. Although it seems that these actions are mitigation strategies, for example turning off extra lights, the survey results revealed that the true intention behind these actions is not what it seems. The results show that people are not willing to make personal sacrifices for the issue at hand. Although many claim that it is everyone's/ own responsibility; there are not many actions that they are willing to take out of their comfort zone. The people seem to underestimate the impact they are having. The results support the findings of Whitmarsh, (2009) that people in Karachi are not taking actions such as energy conservation, recycling, decreasing plastic usage and water conservation due to a concern for climate change. Rather the actions taken by the households reflect a concern for their own gain which mainly includes monetary concerns. This is in negation to literature that assumes that people resort to climate change mitigation strategies by decreasing their consumption of energy. This is an important dimension to consider for policy decisions. The government should adopt strategies for green nudges. These include revamping the energy sector, manufacturing industries, transportation and construction.

Radical actions must be taken, like introducing carbon pricing, that is impose carbon taxes or emissions trading, also known as 'cap and trade'. This can work as an incentive to various sectors of the economy (UN EMISSIONS GAP REPORT 2022). Another significant step in the right direction to lower emissions, will be to encourage usage of public transport, cycling, walking and discouraging usage of private vehicles (Climate

Change 2022: Mitigation of Climate Change (AR6 WGIII)). Pakistan government has taken some measures to provide electric public transport but there needs to be an aggressive policy action to increase the number and improve the quality of service of public transports. Correspondingly it is also important to ensure easy access and sufficient availability of other environmental friendly consumer products (Bonini, & Oppenheim, 2008; and Ottman, Stafford, & Hartman, 2006). It is important to change the behaviour of the people to transition them into adapting PEB (Taghikhah, Voinov, & Shukla, 2019). Thus a holistic approach is required to understand PEBs in order to change to a low-carbon society.

Year 2020 began with the Covid-19 pandemic which forced countries around the world to go into lockdown. Lockdown meant economic activity came to almost a standstill, and the welfare of people and the economy have suffered adversely. However, a massive reduction in economic activities led to cleaner air, much reduced global emissions and less air, water and noise pollution. Lessons can be learnt from the Covid-19 lockdown that in order to save the planet from environment degradation, less disruptive and more planned ways should be incorporated. The state and citizens can work together for a carbon resilient future. Post-Covid-19 world should engage citizens in their capacity to bring forth accepted, embedded and bearable behaviour changes in the context of climate change (Howarth, et al., 2020). For a significant reduction in our carbon footprint, it is imperative that we all work together. Each action matters and there is an urgent need to mobilize the people to take responsibility for their actions. Community level initiatives to change behaviours towards preservation of energy, water and reduction in the use of plastic is the need of the hour. It should be a mandatory part of school curriculum to instil environmentally responsible behaviour from the very beginning. Countries can benefit by incorporating climate change education in the curriculum and by promoting awareness about its adverse effects, and educating learners about mitigation and adaptation strategies (Ahmed, et al., 2022). School and college teachers have an idea what climate change is, and arming teachers with the

knowledge of climate change, its threats and how to mitigate and adapt will help students at an early age to understand the dangers, this in turn will encourage pro-environment behaviour (Chowdhury, et al, 2021). Also not just celebrating Earth day and Water Day for a week, but practicing environment friendly actions daily. Government and NGOs should campaign in a way that gives the message of "Are you doing your bit?" Increased public involvement by holding dialogue, and having community groups and consultation will create the right awareness and bring about long term behavioural change. Impactful media campaign is also needed to ensure people join hands to take the desired actions. Policy makers should design effective communication strategies and pair them with appropriate economic measures to have a significant behavioural change in the people. To bring about behavioural change people will require more and complete information regarding the environmental impact of their actions as suggested in a study by Li, Long, & Chen, (2017). Print, electronic and social media are powerful in creating awareness, starting trends and can be instrumental for environmental campaigning. Today's world follows what the media broadcasts and streams. Therefore, opinions are formed and shaped by the all-powerful social, electronic and print media. Thanks to the reach of media environmental issues have been highlighted. But the media has failed so far to bring forth actual changes in behaviour of the population. As a CSR, media can play its role in propagating environmental activism (Jiménez-Castillo, & Ortega-Egea, 2015).

This study is limited as the internet survey did not reach the length and breadth of Karachi. Therefore, considering the diverse population of this metropolis, the findings of this study should be taken with some reservations. Further, our findings reveal that a certain gender and age bias is there as more females and a younger population have filled the questionnaire. As a future work, data can be gathered which is more representative and surveyors may actually interview the respondents to explain the climate change related nomenclature like climate crisis,

mitigation, carbon footprint, GHG emissions, energy and water conservation, renewable energy etc.

Conflicts of Interest

None declared.

References

Ahmed, Z., Hussain, A. B., Ambinakudige, S., Ahmed, M. N. Q., Alam, R., Rezoan, H. A., ... & Mahmud, S. 2022. "Perceived human-induced causes of landslide in Chattogram metropolitan area in Bangladesh". Earth Systems and Environment, 6(2), 499-515.)

Ahmed, M. N. Q., Ahmed, K. J., Chowdhury, M. T. A., & Atiqul Haq, S. M. 2022. "Teachers' Perceptions About Climate Change: A Comparative Study of Public and Private Schools and Colleges in Bangladesh". Frontiers in Climate, 83.

Ahmed, M. N. Q., & Atiqul Haq, S. M. 2019. "Indigenous people's perceptions about climate change, forest resource management, and coping strategies: a comparative study in Bangladesh". Environment, Development and Sustainability, 21, 679-708.

Alvi, S., Nawaz, S. M. N., & Khayyam, U. 2020. "How does one motivate climate mitigation? Examining energy conservation, climate change, and personal perceptions in Bangladesh and Pakistan". Energy Research & Social Science, 70, 101645.

Bateman, T. S., & O'Connor, K. 2016. "Felt responsibility and climate engagement: Distinguishing adaptation from mitigation". Global environmental change, 41, 206-215.

Bayard, B., Jolly, C. M., & Shannon, D. A. 2007. "The economics of adoption and management of alley cropping in Haiti". Journal of environmental management, 84(1), 62-70.

Bonini, S., & Oppenheim, J. (2008). Cultivating the green consumer. Stanford Social Innovation Review, Fall, 56–61.

Ceglia, D., de Oliveira Lima, S. H., & Leocádio, Á. L. (2015). An alternative theoretical discussion on cross-cultural sustainable consumption. Sustainable Development, 23(6), 414-424.

Change, A. D. C., Blair, T., Pachauri, R. K., & Pachauri, R. 2006. "Avoiding dangerous climate change". Cambridge University Press.

Cheng, P., Wei, J., Marinova, D., & Guo, X. 2017. "Adoption of protective behaviours: Residents response to city smog in Hefei, China". Journal of Contingencies and Crisis Management, 25(4), 244-255.

Choi, D., & Johnson, K. K. (2019). Influences of environmental and hedonic motivations on intention to purchase green products: An extension of the theory of planned behavior. Sustainable Production and Consumption, 18, 145-155.

Chowdhury, M. T. A., Ahmed, K. J., Ahmed, M. N. Q., & Haq, S. M. A. 2021. "How do teachers' perceptions of climate change vary in terms of importance, causes, impacts and mitigation? A comparative study in Bangladesh". SN Social Sciences, 1, 1-35.

Civil Society Coalition for Climate Change (CSCCC). https://www.csccc.org.pk/
Climate Change 2022: Mitigation of Climate Change (AR6 WGIII). https://www.c40knowledgehub.org/s/article/Climate-Change-2022-Mitigation-of-Climate-Change-AR6-WGIII-IPCC

Climate Change Knowledge Portal For Development Practitioners and Policy Makers. https://climateknowledgeportal.worldbank.org/country/pakistan

Climate Risk Country Profile: Pakistan 2021: The World Bank Group and the Asian Development Bank

Elahi, E., Khalid, Z., & Zhang, Z. (2022). Understanding farmers' intention and willingness to install renewable energy technology: A solution to reduce the environmental emissions of agriculture. Applied Energy, 309, 118459.

Fricker, R. D. 2008. "Sampling methods for web and e-mail surveys". The SAGE handbook of online research methods, 195-216.

Gössling, S., Scott, D., Hall, C. M., Ceron, J. P., & Dubois, G. 2012. "Consumer behaviour and demand response of tourists to climate change". Annals of tourism research, 39(1), 36-58.

Gujarati, D. N. (2022). Basic econometrics. Prentice Hall.

Hanss, D., Böhm, G., Doran, R., & Homburg, A. (2016). Sustainable consumption of groceries: The importance of believing that one can contribute to sustainable development. Sustainable Development, 24(6), 357-370.

Hasan, Z., & Akhter, S. 2011. "Determinants of public awareness and attitudes on climate change in urban Bangladesh: Dhaka as a case". European Journal of Social Sciences, 21(1), 154-162.

Howarth, C., Bryant, P., Corner, A., Fankhauser, S., Gouldson, A., Whitmarsh, L., & Willis, R. 2020. "Building a social mandate for climate action: lessons from COVID-19". Environmental and Resource Economics, 76(4), 11071115.

Huda, M. N. 2013. "Understanding indigenous people's perception on climate change and climatic hazards: a case study of Chakma indigenous communities in Rangamati Sadar Upazila of Rangamati District, Bangladesh". Natural Hazards, 65, 2147-2159.

Hussain, M., Liu, G., Yousaf, B., Ahmed, R., Uzma, F., Ali, M. U., ... & Butt, A. R. 2018. "Regional and sectoral assessment on climate-change in Pakistan: social norms and indigenous perceptions on climate-change adaptation and mitigation in relation to global context". Journal of Cleaner Production, 200, 791-808.

Hussain, M., Butt, A. R., Uzma, F., Ahmed, R., Irshad, S., Rehman, A., & Yousaf, B. 2020. "A comprehensive review of climate change impacts, adaptation, and mitigation on environmental and natural calamities in Pakistan". Environmental monitoring and assessment, 192, 1-20.

IPCC, 2007: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Parry, M.L., O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson, (eds.)].

Jang, S. M. 2013. "Framing responsibility in climate change discourse: Ethnocentric attribution bias, perceived causes, and policy attitudes". Journal of Environmental Psychology, 36, 27-36.

Jiménez-Castillo, D., & Ortega-Egea, J. M. 2015. "Too positive to change? Examining optimism bias as a barrier to media effects on environmental activism". Journal of Environmental Psychology, 43, 216-225.

Kenis, A., & Mathijs, E. 2012. "Beyond individual behaviour change: The role of power, knowledge and strategy in tackling climate change". Environmental Education Research, 18(1), 45-65.

Kent, J. C. 2012. "Climate change-whose responsibility? From the personal to the global" (Doctoral dissertation).

Lee, H., Kurisu, K., & Hanaki, K. 2013. "Influential factors on pro-environmental behaviours— A case study in Tokyo and Seoul. Low Carbon Economy", 2013, 4, 104-116. http://dx.doi.org/10.4236/lce.2013.43011 published Online September 2013

Li, Q., Long, R., & Chen, H. (2017). Empirical study of the willingness of consumers to purchase low-carbon products by considering carbon labels: A case study. Journal of Cleaner Production, 161, 1237-1250.

Mani, M., Bandyopadhyay, S., Chonabayashi, S., Markandya, A., Mosier, T. 2018. "South Asia's Hotspots: The Impact of Temperature and Precipitation changes on living standards". South Asian Development Matters. World Bank, Washington DC.

Marie, M., Yirga, F., Haile, M., & Tquabo, F. (2020). Farmers' choices and factors affecting adoption of climate change adaptation strategies: evidence from northwestern Ethiopia. Heliyon, 6(4).

Masud, M. M., Al-Amin, A. Q., Junsheng, H., Ahmed, F., Yahaya, S. R., Akhtar, R., & Banna, H. 2016. "Climate change issue and theory of planned behaviour: Relationship by empirical evidence". Journal of Cleaner Production, 113, 613-623.

Memon, F. S., Abdullah, F. B., Iqbal, R., Ahmad, S., Hussain, I., & Abdullah, M. 2022. "Addressing women's climate change awareness in Sindh, Pakistan: an empirical study of rural and urban women". Climate and Development, 1-13.

Mildenberger, M., Lubell, M., & Hummel, M. 2019. "Personalized risk messaging can reduce climate concerns". Global Environmental Change, 55, 15-24.

Nguyen, H. V., Nguyen, C. H., & Hoang, T. T. B. (2019). Green consumption: Closing the intention-behavior gap. Sustainable Development, 27(1), 118-129.

Ottman, J. A., Stafford, E. R., & Hartman, C. L. (2006). Avoiding green marketing myopia: Ways to improve consumer appeal for environmentally preferable products. Environment: science and policy for sustainable development, 48(5), 22-36.

Pakistan Economic Survey, 2021-2022. Government of Pakistan.

Peattie, K. (2010). Green consumption: behavior and norms. Annual review of environment and resources, 35, 195-228.

Piccolo, L. S., & Alani, H. 2015. "Perceptions and behaviour towards climate change and energy savings: the role of social media".

Saguye, T. S. (2016). Determinants of smallholder farmers' adoption of climate change and variability adaptation strategies: Evidence from Geze Gofa District, Gamo Gofa Zone, Southern Ethiopia. J. Environ. Earth Sci, 6(9).

Salman, A., ul Husnain, M. I., & Aneel, S. S. 2018. Community-based climate change adaptation. Issues old and new, 189.

Sharples, D. 2010. "Communicating climate science: evaluating the UK public's attitude to climate change". Earth and Environment, 5(1), 185-205.

Shuai, C. M., Ding, L. P., Zhang, Y. K., Guo, Q., & Shuai, J. (2014). How consumers are willing to pay for low-carbon products? –Results from a carbon-labeling scenario experiment in China. Journal of Cleaner Production, 83, 366-373.

Sreen, N., Purbey, S., & Sadarangani, P. (2018). Impact of culture, behavior and gender on green purchase intention. Journal of retailing and consumer services, 41, 177-189.

Stern, P. C. 2000. "New environmental theories: toward a coherent theory of environmentally significant behaviour". Journal of social issues, 56(3), 407-424.

Taghikhah, F., Voinov, A., & Shukla, N. (2019). Extending the supply chain to address sustainability. Journal of cleaner production, 229, 652-666.

Trivedi, R. H., Patel, J. D., & Acharya, N. (2018). Causality analysis of media influence on environmental attitude, intention and behaviors leading to green purchasing. Journal of cleaner production, 196, 11-22.

The World Bank Data. Electricity production from oil, gas, and coal sources (% of total) - Pakistan https://data.worldbank.org/indicator/EG.ELC.FOSL.ZS?locations=PK

UN Emissions Gap Report 2022. https://wedocs.unep.org/bitstream/handle/20.500.11822/40875/EGR2022_KR.pdf?sequence=3

Urban, J., & Ščasný, M. 2012. "Exploring domestic energy-saving: The role of environmental concern and background variables". Energy policy, 47, 69-80.

Wang, T., Shen, B., Springer, C. H., & Hou, J. (2021). What prevents us from taking low-carbon actions? A comprehensive review of influencing factors affecting low-carbon behaviors. Energy Research & Social Science, 71, 101844.

Whitmarsh, L. 2009. "Behavioural responses to climate change: Asymmetry of intentions and impacts". Journal of environmental psychology, 29(1), 13-23.

Whitmarsh, L., Poortinga, W., & Capstick, S. 2021. "Behaviour change to address climate change". Current Opinion in Psychology, 42, 76-81.

Wu, S. I., & Chen, J. Y. (2014). A model of green consumption behavior constructed by the theory of planned behavior. International Journal of Marketing Studies, 6(5), 119.

Appendices

Table A1: Correlation Matrix for independent variables in the first Logit regression for energy conservation

	Gender	District	Age	Edu.	HH size	HH income	Think CC real	Action to mitigate CC impact	Satisfied with habits	Turn off extra lights	Participation in campaigns	Suffered from heat waves
Gender	1.00											
District	0.04	1.00										
Age	-0.12	0.09	1.00									
Education	-0.06	0.01	0.46	1.00								
HH size	-0.01	0.07	-0.09	-0.02	1.00							
HH income	-0.01	0.09	-0.02	0.07	0.02	1.00						
Think CC real	-0.02	-0.05	0.03	0.01	0.03	-0.13	1.00					
Taken action to mitigate CC impact	0.11	-0.07	-0.09	-0.16	-0.08	-0.08	0.13	1.00				
Satisfied with habits to reduce carbon footprint, and energy use	-0.01	-0.13	-0.25	-0.13	-0.09	0.23	-0.07	0.08	1.00			
Reasons to turn off extra lights	0.04	0.04	0.03	-0.03	-0.07	0.09	0.01	-0.03	0.01	1.00		

Particip ation in campaig ns about CC	0.03	0.04	0. 16	0.0 5	- 0. 08	- 0.00	- 0.0 3	0.09	-0.01	0.0 1	1.00		
Suffered from heat waves	0.06	0.10	0. 05	- 0.0 1	- 0. 04	0.11	0.0 0	0.12	0.01	0.0 9	0.04	1.00	

Note: HH means household, and CC means climate change

Table A2: Correlation Matrix for independent variables in multinomial logistic regression related to using cloth bags out of concern for climate change

	use/ purc hase recy cled item s	Rec ycle	camp aigns about CC	Tr ees	Pollu tion affec ted healt h	Irrita ted by pollu tion	Gen der	Dist rict	A ge	E du .	H H si ze	H H in c.	Thi nk CC rea l	Miti gate CC	Ha bit
use/ purch ase recycl ed items	1.00														
Recyc le	0.03	1.00													

campaigns about CC	0.15	0.08	1.00												
Trees	0.07	0.13	0.12	1.00											
Pollution affected health	0.07	0.02	0.08	0.08	1.00										
Irritated by pollution	0.11	0.06	0.08	0.01	0.32	1.00									
Gender	-0.01	0.24	-0.03	-0.03	-0.12	0.01	1.00								
District	0.01	-0.00	0.03	-0.06	0.03	0.06	0.04	1.00							
Age	-0.03	-0.08	0.15	-0.04	0.00	0.06	-0.12	0.09	1.00						
Education	0.02	-0.05	0.05	-0.06	-0.02	-0.02	-0.07	0.02	0.46	1.00					
HH size	-0.04	-0.04	-0.09	-0.03	0.00	-0.02	-0.01	0.07	-0.07	-0.02	1.00				
HH income	0.07	-0.09	-0.00	-0.01	0.16	0.11	-0.01	0.08	-0.02	0.07	0.02	1.0			
Think CC real	0.04	0.10	-0.03	-0.03	0,07	-0,01	-0.02	-0.06	0.04	0.01	0.03	-0.1	1.00		
Action to mitigate CC	0.10	0.15	0.09	0.14	0.05	0.08	0.12	-0.08	-0.09	-0.16	-0.09	-0.1	0.13	1.00	
Satisfied with habits to reduce carbon footprint, and	0.07	0.04	-0.01	0.05	0.09	0.03	-0.01	-0.14	-0.25	-0.13	-0.09	0.22	-0.07	0.09	1.00

energy use													

Note: HH means household, and CC means climate change
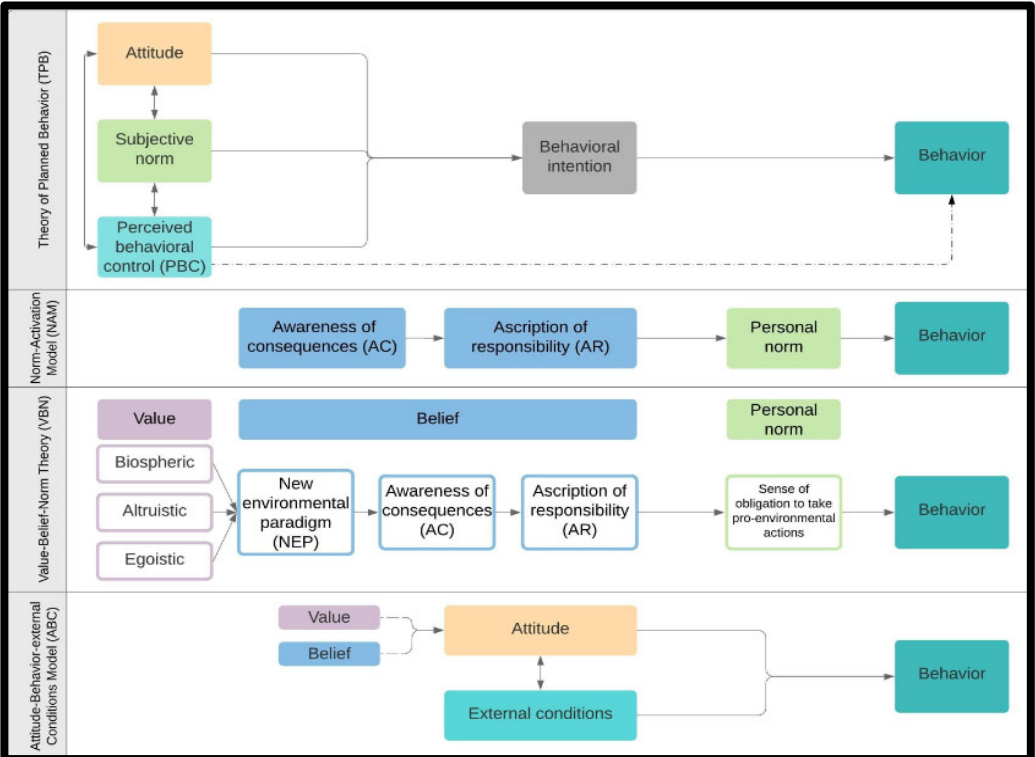
Figure A1: Comparison of theories

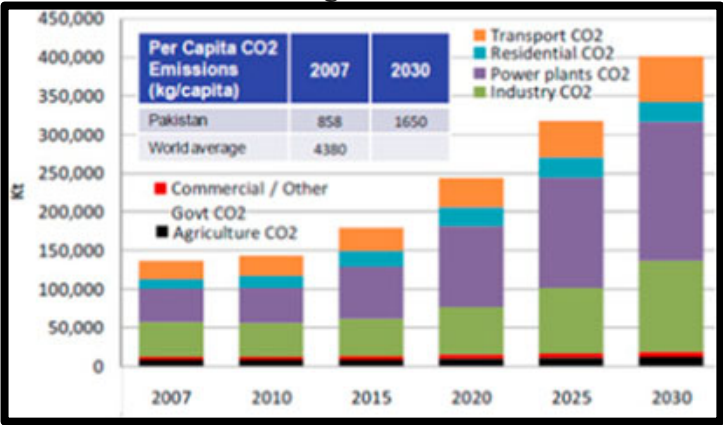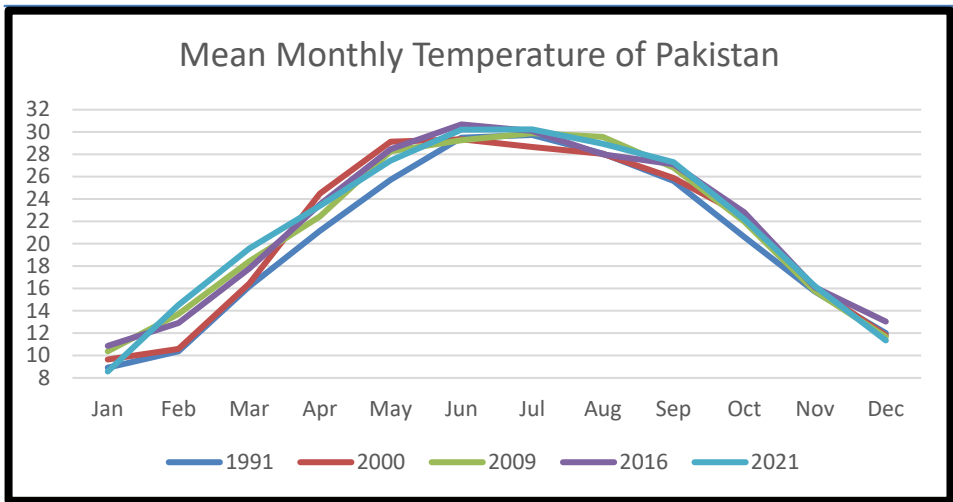Image Source: Wang, Shen, Springer, & Hou, (2021).

Figure A2

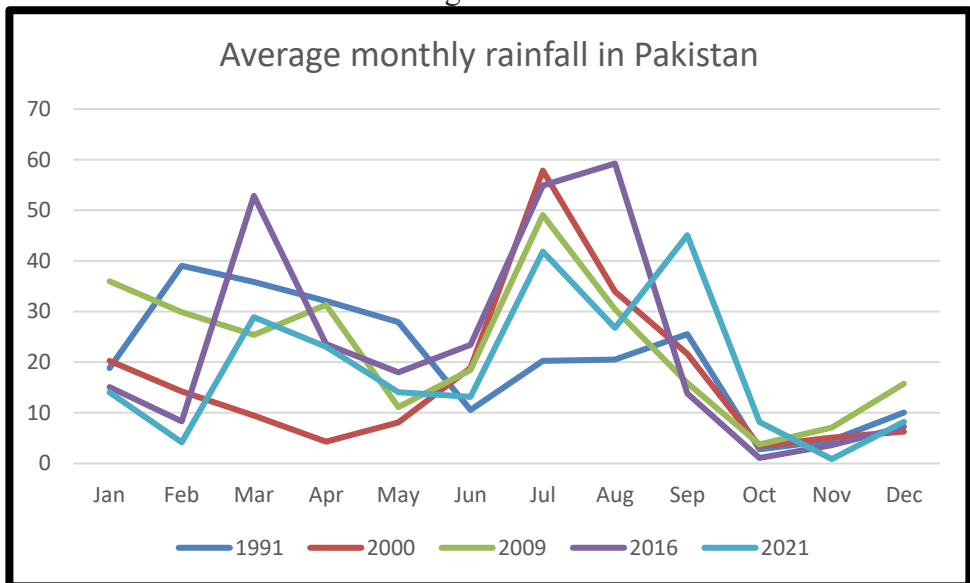Image Source: Abas, Kalair, Khan, & Kalair, (2017).

Figure A3

Source: World Bank Climate Change Knowledge Portal
Note: This is only for selected years.

Figure A4

Source: World Bank Climate Change Knowledge Portal

Note: This is only for selected years.

Determinants of Ecological Footprint: Empirical Evidence from Selected South Asian Economies

* Faizan Noor

Abstract: This study investigated the impact of globalization, tourism travel expenditures, technological innovations and population density on the ecological footprint of India, Pakistan and Bangladesh during the period of 1995 to 2020. To measure the short and long run association, Panel Auto Regressive Distributive Lag (ARDL) method is utilized. The results indicate that there is significant positive long run relationship between globalization & technological innovation with the ecological footprint of India, Pakistan and Bangladesh. While, contrarily, expenditures on tourism travel and population density has significant negative impact on the ecological footprint. The study suggests limiting the level of globalization at optimum level and favors innovations of green technology.

Key Words: Tourism, Globalization, Technological innovations, Population density, Ecological footprint

1. Introduction

It is an observed fact that climate change due to environmental degradation has adversely affected the economic and social sectors of subcontinent region during last few years. In order to fulfill the ambition of economic development, the economies of Sub Continent started adopting policies of globalization, technological innovations, promotion of tourism and management of population burden to maintain the population density less dense.in their geographical and historical places. But the consequences of this growth had to be borne in the form of environmental degradation and climate change due to high emission of greenhouse gases and $CO2$. During past few years environmentally sustainable development has become an important solicitousness for all economies of the world, with the goal of carbon neutrality in consideration (Tao et al., 2021). The multifarious nature of economic, social and environmental human pursuits has incited a negotiation between economic growth and ecological perseverance (Nathaniel et al., 2021b).

India, Pakistan and Bangladesh are such countries in South Asia that have 14 out of the world's 15 cities that are hazardous contaminated by the noxious particles marked (P.M 2.5). The latest global alliance on health and pollution report on health data synthesis 2019 reveals that India stands second, while, Pakistan third following China, in the figures where people kick the bucket prematurely each year due to pollution. Whereas, during winter season in this region bloomy mist, substantial with Sulphur and lead condenses as winds and rains abate. Moreover, throughout November Delhi witnessed atrocious five-day span of smog since 2016. On the other hand, World Health Organization and epidemiologists expressed concerns that deadly air pollution in Pakistan and India may increase the ratio of Covid-19 death.

In no other region of the world has pollution become more intense in the past few years than in Pakistan, India and Bangladesh, which are home to one third of the global population. An if this situation continues for the next few years, the environmental degradation will have more devastated effects on these economies. Projections of the World Health Organization' recent report reveals that the life expectancy has decreased by 6.7 years in Bangladesh. The estimates of global climate risk index 2020 reveals that among the countries that are most effected by climate change during the period of 1999-2018, Pakistan ranks 5th and Bangladesh 7th with CRI score of 28.83 and 30.00 respectively. During this period Pakistan faces the loss of 3792.52$ million and Bangladesh 1686.31$ million. India, on the other hand, ranked 5th in this ranking in 2018 in terms of climate risk and bore the loss of 37807.82 $ million.

Different scholars have utilized different variables to measure the environmental quality. Among these most of the researchers employed ecological footprint as a reliable quantitative scale to determine the environment finest. Ecological footprint is suitable indicator of environment quality in comparison with CO_2 emission (Anser et al., 2021; Shokoohi et. al 2022). The fundamental advantage of ecological footprint is that it quantifies the demand and supply side of the nature. To measure the demand aspect, it sums up all the productive fields for which an individual or merchandise compete. The ecological footprint calculates the

ecological capital that a specific group of individuals or goods demand to produce the natural resource it uses (comprising food items and fiber goods, livestock and fish items, places for urban framework) and to take up its byproduct, particularly the discharge of CO_2. The ecological footprint is a broad gauging metric used to compares the emission of greenhouse gases by resource utilization of human beings with natural means restoration and devastation assimilation ability (Nathaniel et al., 2021a;). Enhancement of industrial sector, tourism and globalization have substantially abated the environmental resources and accelerated the ecological footprint matric (Sarkodie, 2021).

Carbon footprint is assumed as one of the significant and swiftly increasing element of environmental footprint. It is utilized to quantify the fossil fuel oriented outflow of greenhouse gases. This continuous concentration of carbon dioxide in air is termed as ecological debt. Presently, the share of CO_2 in overall global ecological footprint stands 60% (Global Footprint Network, 2020). Now a day, rapid roaring ecological footprint is assumed a foremost interest of researchers, who associate distinct economic and ecological footprint to find suitable answers. Hence the foremost objective of research is to empirically analyze the influence ofglobalization, tourism expenditures, technological innovations and population density on ecological footprint of Pakistan, India& Bangladesh by using the data from 1990 -2018.

Growing tourism is playing its significant role in global economic development. Development of tourism sector not only contributes in the growth of national income of the country but also considered essential for creating employment opportunities. Development of tourism proliferate the income of transporters, ameliorates the provision of infrastructure to elevate trade. Despite the key role of this sector in economic development, tourism sector is alsoa major contributor of climate deterioration caused by excessive emission of CO_2 and greenhouse gases (GHG) as a result of fuel consumption by transportation sector. The tourism sector's share in CO_2 emission is about 75% (Zhang & Liu, 2019). Besides, the development of tourism sector paves the way for developing the infrastructure on modern lines to provide adequate facilities to the tourists, which leads to environmental pollution by depleting natural resources (Razzaq et al., 2021a; Nathaniel et al., 2021b).

Another factor which may have eloquent effect on ecological footprint is globalization. Globalization refers to the multidimensional social, cultural, economic and political association among the nations of the world. Globalization has promoted trade activities, technological innovations, skills of the workers, social norms and tourism among the world community (Godil et al., 2021). Globalization lure nations to use modern technology and utilization of nonrenewable energy resources to meet the needs of energy requirements for different sectors of the economy that leads it towards the more emission of CO_2 and GHG that contaminate the environment. Only strong political will and determination can limit the impact of globalization on the environment by adopting environment friendly green technology (Pata, 2021; Saud et al., 2020). It is an observed fact that globalization promotes research and development and that leads to the invention of modern production tools and methods that are effective in controlling environmental degradation.

Technological innovations have reshaped the production sectors of the economies. Today, almost every economy of the world tries to invent such production equipment's and methods that may not only produce large amount of goods but also pose little effect on the ecological foot print. Most of the developed countries of the world have shifted their production units on modern technologies while, developing countries are also making steps to use those production techniques that are less harmful for environment. Therefore, it is essentil to measure the impact of technological innovations on the ecological foot print.

Population is another key factor which contributes in increasing the level of ecological footprint. Population expansion escalatesthe need of fossil fuels and energy, this increase in demand brings increase in ecological footprint in return by releasing more greenhouse gases and CO_2 into the atmosphere. Population density is decisive element in deciding the level of ecological foot print (Gupta, Saini and Sahoo, 2022). Population density is inversely related with the ecological footprint (Kongbuamai, Zafar, Zaidi and Liu. 2022)

Pakistan, India and Bangladesh are emerging economies of Subcontinent with similar social, political and economic systems. For the sake of economic prosperity these economies are following multi-faceted strategies including tourism, technological innovations and globalization that have adversely affected the environment of these economies. Therefore, there is a dire need to examine the influence of these factors on the ecological foot print of Pakistan, India and Bangladesh. This study will measure the influence of globalization, technological innovations, tourism development and population density on the ecological foot print of Pakistan and India and Bangladesh by employing the data from 1990 to 2020.

Despite the rising fear about environmental sustainability and the growing significance of measuring ecological footprints, there is a prominent hole in the prevailing literature concerning the exact determinants of ecological footprints in South Asian economies. While several analyses have investigated this theme on a universal scale or in the setting of developed countries, there is an inadequate body of research that probes into the exclusive aspects and dynamics inducing ecological footprints in South Asian nations. This research gap is predominantly critical given the region's diverse socio-economic and environmental characteristics, along with its noteworthy population size and fast economic growth, all of which contribute to typical ecological footprint patterns. Hence, there is a need for empirical study and in-depth analysis to recognize and comprehend the vital determinants shaping ecological footprints in South Asian countries, which can enlighten policy-making and sustainable development policies tailored to the region's specific opportunities and challenges.

2. Review of the Literature

2.1 Globalization and Ecological Footprint Nexus

Sabir and Gorus (2019) empirically analyzed the impact of globalization measures FDI, trade openness KOF and technological innovations on the ecological footprint of South Asian economies during the period of 1975 to 2017. The study utilized ARDL method to examine the long-run associatio among the regress and regressors. The findings of the study suggest that globalization measures have significant impact on the

ecological footprint . While, technological changes have insignificant influence on the ecological footprint.

Rehman et al. (2021) analyzed the effect of globalization, energy use and trade on the environmental footprint of Pakistan by utilizing data from 1974 to 2017. The study used ARDL method to measure the long run relationship among the dependent variable and regressors. Results of the study indicate that globalization, energy use and trade have significant positive impact on the ecological footprint of Pakistan. Likewise, Yang et al. (2021) have empirically examined the impact of globalization and population aging on the ecological footprint of OECD countries by using panel data during 10970 to 2017. The study used pooled mean group method to calculate the association between the variables. The findings of the study reveals that globalization and population aging have significant negative impact on the ecological footprint of OECD countries.

Awosusi et al. (2022) studied the effect of globalization, political risk and technological innovations on the ecological footprint of BRICS countries. The study utilized panel quantile regression to investigate the relationship between variables. The results of the study reveal that political risk, economic growth and technological innovations have positive significant impact on the ecological footprint in BRICS countries. On the other hand, globalization has significant positive association with the ecological footprint. Moreover, Amegavi, Ahenkan and Buebeng (2022) empirically analyzed the impact of economic globalization and bureaucratic quality on the ecological footprint of Ghana during the time period of 1990 to 2016. To measure the short run and long run association among variables the study has used autoregressive distributive lag method. The results of the study show that economic globalization has negative impact on the ecological footprint of Ghana. Inversely, institutional quality has shown meaningful positive impact on the environentl footprint.

2.2 Tourism and Ecological Footprint Nexus

Salih, Gokmenoglu and Even (2018) evaluated the effect of tourism advancement on the environmental quality of op 10 tourists visiting countries of the world. The study utilized ecological footprint as proxy for

environmental quality. The findings of the study reveal that there is evidence of inverted U shaped Kuznets curve existence. Moreover, tourism development has shown significant negative effect on the ecological footprint of Turkey.

Godi, Sharif, Rafique and Jermsittiparsert (2020) measured the implication of tourism, financial improvement and globalization on the ecological footprint of Turkey during the period of 1988 to 2018. The ARDL model is utilized to estimate the short and long run relation between ecological footprint and regressors. The results of the ARDL show that tourism, financial growth and globalization have positive meaningful effect on the ecological footprint of Turkey. Similarly, Xiaojuan et al. (2022) measured the outcome of inbound tourism on the ecological footprint in top 10 densely populated countries of the world during the period of 1995 to 2021 by using dynamic panel threshold model. The estimates of the study indicate that tourism improves the environment at some extent and after reaching at optimal level enhancement in inbound tourism adversely affect the environment.

Liu, Farah, Wajahat and Tafazal (2022) empirically analyzed the presence of environmental Kuznets curve travel & tourism and ecological footprint of Pakistan during the period of 1980 to 2017. In order to measure the influence of tourism expansion, economic growth, energy consumption, trade openness and foreign direct investment on the ecological footprint, the study used ARDL method. The results of the study confirm that the regressors have significant contribution in environmental degradation of Pakistan.Guven and Bolu (2022) analyzed the effect of tourism, energy consumption and economic growth on the environmental quality of Turkey during the period of 1963 to 2016. The results of the Vector Error Correction model show that tourism development has no effect on the environment of Turkey. Whereas, on the other hand, energy consumption and economic growth have adversely affected the environmental quality of Turkey .

2.3 Population Density and Ecological Footprint Nexus

Audi et al.;(2016) discovered the essence of significant positive correlation among energy use, financial advancement and population density in Lebanon during the time period of 1974 to 2014. Also, Sasleem

at al.; (2018) in their empirical study found the presence of meaningful positive relationship between the population density and carbon dioxide (CO2) emmission for selected panel of economies during the time span of 1975 to 2015.Sciubba and Weber (2019) evaluated the implication of population growth on the CO2 emmission by using panel data of 1062 regions of 22 European nations during the time spane of 1990 to 2006. The estimates of the study indicate that regions with high population growth witnessed higher level of carbon emmissoin as compared to lower population growth regions of Europe.

Edwards (2020) examined the significance of total population, immigration and alternative energy usage on the CO2 emission in United States of America. The findings of the estimation show that there exists positive significant relation between population, immigration and CO2 emission in USA. While Chaurasia (2020) empirically investigated the influence of population on the CO2 emission via global energy demand. The study used the panel of 44 most CO2 emmitted countries of the world during the period of 1990 to 2019.. The estimates of the study reveal that increase in global energy use due to increase in population has positively contributed in the CO2 emission of selectedcountrires.

2.4 Technological Innovations and Ecological Foorprint Nexus

Manga and Destek (2021) empirically analyzed the significance of technological innovations and financializaion preocess with renewable and non renewable energy sources as control varibles on the carbon emmission and ecological footprint of big emerging economies during the period of 1995 to 2016. The study has utilized second generation panel methods to calculate the interdependance among variables. The evidence of the study show that technological innovations and financialization have signficant role in co2 emission, While, they have insignificant effect on the ecological footprint.

LiXu, Wang, Wang and Zhang (2022) measured the role of technological advancement, natural resources prices, foreign direct investment and renewable energy prices on the ecological footprint of

China by using time series data from 1990 to 2017. The study used FMOLS, DOLS and CCR methodologies to investigate the effect. The results of the study indicate that technological advancement natural resources prices and renewable energy sources reduced the ecological footprint in China. Whereas, on the other hand, foreign direct investment has contributed in the enhancement of ecological footprint. Moreover, Gao et al., (2022) analyzed the role of green technology innovations on the CO2 emmision in 30 chinese provinces over the period of 2008 to 2020. The study has used fixed and mediating effecct methodologies to estimate the parameters. The results indicate that green technology innovations has limit the CO2 emmissions in the selected panels of China.

Mohini , Saini and Sahoo (2022) the empirically assessed the potantial of ecological footprint of Bangladesh during the period of 1990 to 2016. The study utilized technological innovations, urbanization and natureal resources as key determinants of ecological footprint of Bangladesh. In order to measure the long run effect, the study used ARDL bound method. The findings sugdest that technological innovations and natural resources have reduced the ecological footprint. While, urbanization has adverese effect on the ecological footprin of India.

3. Research Design and Methodology

During last two decades a serious attention has been given to the issue of environmental degradation in developing and developed countries and various factors are held responsible for this degradation. Among these, globalization, tourism and population growth are important contributors in carbon emission in developing countries. Countries of south Asian Regions Pakistan, India and Bangladesh are top in the list among those countries where the issue of environmental degradation is becoming more serious with the passage of time.

The study is designed to investigate the impact of globalization, tourism development, Technological innovations and population density on the ecological foot print of Pakistan, India and Bangladesh during the period of 1995 to 2020. The functional form of the model will be as follows

$$EFPit = f(GLOBit, TEit, PRNit, POPDit)$$

In order to measure the association among the parameters of dependent and explanatory variable, the econometric form of the model is as follows

$$lnEFP_{it} = \beta_0 + \beta_1 lnGLOB_{it} + \beta_2 lnTE_{it} + \beta_3 lnPRN_{it} + \beta_4 POPD_{it} + \mu_{it}$$

Where

$EFP_{it} = Ecological\ footprint$

$GLOB_{it} = Globalization$

$TE_{it} = Expenditures\ on\ Tourism\ travel$

PRN_{it} = Number of Patent Rights Registered

$POPD_{it} = Populatioin\ Density$

$\mu_{it} = Residual$

$ln = Natural\ Log$

Demonstration and Sources of Data

Variable	Demonstration	Unit	Sources of Data
EFP_{it}	Ecological footprint	% Per Capita	Global Footprint Network (GFN)
$GLOB_{it}$	Globalization	% KOF Globalization Index	WDI
TE_{it}	Expenditures on Tourism travel	Percentage	WDI
PRN_{it}	Number of Patent Rights (Proxy of Technological Innovations)	In numbers	WDI
$POPD_{it}$	Populatioin Density		WDI

		Total Numbers	
Ln	Natural Log		

As mentioned in the above table, we used globalization, expenditures on tourism travel, technological innovation and population density as independent variables. Globalization often leads to increased international trade, which can boost consumption and production. As countries engage in global supply chains, they may produce and consume goods and services that have higher ecological footprints. This can result in increased resource extraction, energy use, and emissions. Likewise, tourism generates a significant amount of waste, including plastic bottles, packaging, and disposable items. The disposal of waste in environmentally responsible ways can mitigate the ecological impact of tourism travel. Further, innovations in energy-efficient appliances, building design, and transportation can lead to lower energy consumption and, consequently, a reduced ecological footprint in terms of energy-related emissions. Moreover, as a population grows, there is typically an increase in the demand for essential resources such as food, water, energy, and raw materials. This heightened demand can lead to over-exploitation of natural resources, resulting in a larger ecological footprint.

3.1 Econometric Specification

3.1.1 Panel Auto Regressive Distributive Lag (ARDL)

Economic literature provides various methods to estimate the panel data models. On one side from the perspective of Loyza and Racieenodel (2006) there are traditional panel models like pooled OLS, fixed and random effects. But the drawback of these usual techniques is that these are unable to distinguish between short run and long run results. Moreover, according to Campos and Kinoshitev (2008) the estimates of traditional methods give biased results in the presence of endogenous regressors. While, on the contrary, the methods of dynamic panel models GMM-difference and GMM-system estimates are fruitful when the panel contains

large number of countries (N) as compare to the time span (T) i.e. N>T (Arellano and Bond; Arellano and Bover).

Considering the drawbacks of different panel methods, the study focused on panel auto regressive distributive lag model (Panel ARDL). The advantage of this technique is that on one side it provides short run and long run estimates separately and on the other side, it is applicable in the case when variables are stationary at different level of order. This technique is also suitable when we have large number of time and smaller group of countries, as in the case of this study. When variables are of $I(1)$ and co-integrated the residual will follow $I(0)$ process. One of the fundamental property of co-integrated variable is its return to any divergence from long run equilibrium. This property predicts the dynamics of error correction which arises due to the divergence of the variables in the model from equilibrium. Therefore, it is rational to re-characterize the above model into the error correction form

$$\Delta Y_{it} = \emptyset_i Y_{t-j} + \theta_i X_{i,t-j} \sum_{j=1}^{p-1} \gamma_{ij} \Delta Y_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij} \Delta X_{i,t-j} + \mu_t + \varepsilon_{it}$$

Here $\emptyset$, which is error correction parameter reveal the rapidity of correction. In case, when $\emptyset = 0$ long run relationship does not exist. Therefore, for a long run relationship among dependent variable and repressors it is essential for $\emptyset i$ to be significant with the negative sign and its value must lie between 0 and 1. Because only in that case, it will reveal the convergence tendency.

4. Results of The Estimation

4.1 Panel Unit Root Test

Before applying an appropriate technique to estimate the model, it is proposed to check the stationarity of the variables. In the literature there are various methods available to predict the unit root. Among these the study has used Lin Li Chu (2002) test. The null hypothesis of this test shows the

presence of unit root. The findings of this test indicate that ecological footprint is stationary at level, while, globalization and tourism travel expenditures and number of patent rights are stationary at first difference. Hence the given model also supports the application of panel ARDL methodology for estimation.

4.2 Results of the Estimation

The study used panel ARDL method to estimate the association among ecological footprint and regressors. The results of the estimation are given in the following table.

Table 1. Short Run Results

	Coefficient	St. Erroe	t-Statistic	Prob.*
COINTEQ01	-0.670065	0.292076	-2.294143	0.0327
D(LNGLOB)	-1.617241	0.840462	-1.924229	0.0687
D(LNTTE(-2))	0.087477	0.009272	9.434869	0.0000
D(LNPRN)	-0.343420	0.133774	-2.567160	0.0184
D(POP_DENSITY)	-0.219889	0.766864	-0.286738	0.7773
D(POP_DENSITY(-3))	-0.542320	0.538386	-1.007308	0.3258
C	2.648288	1.306294	2.027329	0.0562

Table 2. Long Results of Panel ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNGLOB	1.728667	0.125010	13.82821	0.0000
LNTTE	-0.440725	0.053333	-8.263727	0.0000

LNPRN	0.618447	0.022509	27.47580	0.0000
POP_DENSITY	-0.008767	0.000718	-12.21341	0.0000
Author's own calculations (EViews 10)				

The results of the estimation indicate that there exist long run relationship between the dependent variable and regressors as the value of error correction is negative significant and lies between zero and one i.e. -0.670065. Globalization has shown positive significant impact on the ecological footprint of Pakistan, India and Bangladesh. A 1 percent increase in the globalization bring 1.013599 increase in the ecological footprint of these nations. The same significant positive long run relation has also been endorsed by the studies of Sabir & Gorus (2019) Rehman et al. (2021), Guan et al., (2022) and Awasusi et al. (2022). This positive impact may infer that the globalization has assisted the spread of innovation and technology across the globe that led to the expansion of more helpful and environmental technologies that help to reduce the ecological footprint. Also, globalization has promoted greater intercontinentalcooperation and intelligence sharing on environmental issues. Nations and governments are now able to switch information, research conclusions, and appropriatemethods on sustainability and environmental conservation. This collective knowledge assists in discoveringhelpfulanswers to moderate the ecological footprint internationally.In other words, from the perspective of knowledge sharing and partnerships, globalization has encouraged greater global collaboration and knowledge sharing on environmental issues which helps in finding effective solutions to reduce the ecological footprint globally.

Whereas, on the other hand tourism travel expenditures has significant negative effect on the ecological footprint. Increase in tourism travel expenditures make tourism costly and as a result only a few tourists visit the tourist's spots. It limits the demand and consumption of fossil fuels

at lower level which is beneficial for ecological footprint. These findings are consistence with the findings of Khan and Hou (2021) and Balli et al. (2019) but contrary with the results of Guan et al. (2022). A 1 % increase in the tourism travel expenditures brings 0.440725 % fall in the ecological footprint. Moreover, technological innovations have shown the positive and significant impact on the ecological footprint. Chunling et al. (2021) also found the same positive association of technological innovation in the case of Pakistan but inconsistent with the results of Adebayo &Odugbesan (2021) for Brazil, Khan et al. (2020), and Ahmad et al. (2020) for China. A 1 % increase in the number of patent rights brings 0.618447% increase in the ecological footprint. While population density has shown the negative impact on the ecological footprint. A 1% increase in the population density of India, Pakistan and Bangladesh brings 0.008767 fall in the ecological footprint. At present, population density of Pakistan, India and Bangladesh is 288.55, 464.15 and 1265.18 respectively (World Bank 2020). Whereas, only few big cities of these countries are densely populated. Moreover, this negative association is due to the fact that consumption mainly depends on availability of natural resource. While, abundant resources are presently available in these countries to explore which are adequate to maintain balance within the ecosystem. This negative association of population density with the ecological footprint endorsed the findings of Kongbuamai, Zafar, Zaidi and Liu (2022), Aşıcı and Acar (2016), Aşıcı and Acar (2018) for 87 economies and Dogan et al. (2020) for BRICST.

5. Conclusion and Policy Recommendation

5.1 Conclusion

Environmental degradation is the ultimate result of various human activities. Almost all the developing and developed countries of the world are facing the severe issue of environmental degradation and climate change. Among these, India, Pakistan and Bangladesh are the main countries in South Asia who are facing the consequences of this environmental degradation in the form of economic damages. It is therefore needed to determine those factors who are responsible for this issue. For

this purpose, the study has used globalization, tourism development, technological innovations and population density as the key determinants of ecological footprint during the period of 1995 to 2020. The study utilized panel ARDL method to measure the association among the variables. The results of the study indicate that there exist significant long run relationship among ecological footprint and regressors. Globalization and technological innovations have shown positive effect on the ecological footprint. Whereas, tourism development and population density have negative impact on the ecological footprint of India, Pakistan and Bangladesh.

5.2 Policy Recommendations

Considering the results of estimated the study proposed following policy measures to policy makers

- As globalization and innovations have positive significant impact on ecological footprint therefore, policy makers should focus on the promotion of globalization and innovations at sustainable level to save the environment. Moreover, policy makers should devise such policies that may help to create environment friendly green technological innovations.
- While, on the other hand, tourism and population density has shown negative effect. Hence, policy makers should make sustainable level of tourism and population density.
- To harness the positive impact of globalization on ecological footprints and promote sustainable development, policymakers can implement a range of policies and strategies: 1) Encourage international trade agreements that prioritize environmental sustainability. This can include provisions for the promotion of sustainable practices, reduced trade barriers for green technologies, and the incorporation of environmental standards in trade negotiations. 2) Implement carbon pricing mechanisms, such as carbon taxes or cap-and-trade systems, to internalize the environmental costs of greenhouse gas emissions associated with global trade. Revenue generated from these mechanisms can be reinvested in clean energy and sustainable infrastructure projects.

- Governments of South Asian economies need to prioritize investments in renewable energy sources, such as solar, wind, and hydropower. Provide financial incentives, subsidies, and tax breaks to promote the adoption of clean energy technologies.
- As our study reported that technological innovation has positive impact on ecological footprints in long run so governments need to allocate additional funding for research and development (R&D) initiatives focused on environmentally friendly technologies and practices. Also, need to provide tax incentives for businesses and organizations that invest in R&D aimed at reducing their Ecological Footprint.

References

Abraham Ayobamiji Awosusi, T. S. (2022). Role of technological innovation and globalization in BRICS economies: policy towards environmental sustainability. *International Journal of Sustainable Development & World Ecology, 29, 2022*(7), 593-610. doi:https://doi.org/10.1080/13504509.2022.2059032

Adebayo, T. S., & Odugbesan, J. A. (2021). Modeling CO2 emissions in South Africa: empirical
evidence from ARDL based bounds and wavelet coherence techniques. Environmental
 Science and Pollution Research, 28(8), 9377–9389.

Ahmad, M., Jiang, P., Majeed, A., Umar, M., Khan, Z., & Muhammad, S. (2020). The dynamic
impact of natural resources, technological innovations and economic growth on ecological
footprint: An advanced panel data estimation. Resources Policy, 69, 101817. https://doi.org/
10.1016/j.resourpol.2020.101817

Amegavi G. B., Langnel Z., Ahenkan A. & Buabeng T. (2022) The dynamic relationship between
economic globalisation, institutional quality, and ecological footprint: Evidence from
Ghana, The Journal of International Trade & Economic Development, 31:6, 876-893, DOI: 10.1080/09638199.2022.2033303

Arellano, M.; Bond, S. Some tests of specification for panel data: Monte Carlo evidence and an
application to employment equations. Rev. Econ. Stud. 1991, 58, 277–297. [CrossRef]

Arellano, M.; Bover, O. Another look at the instrumental variable estimation of error-components models. J. Econom. 1995, 68, 29–52. [CrossRef]

Aşıcı AA, Acar S (2016) Does income growth relocate ecological footprint? Ecol Indic 61:707–714
https://doi.org/10.1016/j.ecolind. 2015.10.022

Aşıcı AA, Acar S (2018) How does environmental regulation affect production location of non-carbon
ecological footprint? J Clean Prod 178:927–936. https://doi.org/10.1016/j.jclepro.2018.01.030

Anser, M. K., Apergis, N., Syed, Q. R., & Alola, A. A. (2021). Exploring a new perspective of
sustainable development drive through environmental Phillips curve in the case of the BRICST
countries. Environmental Science and Pollution Research, 28(35), 48112–48122.

Audi, Marc and Ali, Amjad (2016): *Environmental Degradation, Energy consumption, Population Density and*
Economic Development in Lebanon: A time series Analysis (1971-2014). Centre d'Economie de la
Sorbonne Universite Paris 1; AZM University Business Faculty t https://mpra.ub.uni-muenchen.de/74286/

Awosusi A. A., Adebayo T. S, Kirikkaleli D. & Altuntaş M. (2022) Role of technological innovation
and globalization in BRICS economies: policy towards environmental sustainability, International
Journal of Sustainable Development & World Ecology, 29:7, 593-610, DOI: 10.1080/13504509.2022.2059032

Balli E, Sigeze C, Manga M, Birdir S, Birdir K (2019) The relationship between tourism, CO_2 emissions, and economic growth: a case of Mediterranean countries. Asia Pacific J. Tour. Res.
24:219–232. https://doi.org/10.1080/10941665.2018.1557717

Campos, N.F.; Kinoshita, Y. (2008). Foreign Direct Investment and Structural Reforms: Evidence from Eastern
Europe and Latin America; International Monetary Fund, IMF Institute: Washington, DC, USA, 2008.

Chaurasia, A. (2020). Population effects of increase in world energy use and CO2 emissions: 1990–2019. *The Journal of Population and Sustainability, Vol. 5 No. 1 (2020)*. doi:https://doi.org/10.3197/jps.2020.5.1.87

Choi, I. Unit root tests for panel data. J. Int. Money Financ. 2001, 20, 249–272. [CrossRef]
Chunling, L., Memon, J. A., Thanh, T. L., Ali, M., & Kirikkaleli, D. (2021). The impact of

public-private partnership investment in energy and technological innovation on ecological

footprint: The case of Pakistan. Sustainability, 13(18), 10085. https://doi.org/10.3390/su131810085

Danish Iqbal Godil, D. I. (2020). The asymmetric effect of tourism, financial development, and globalization on ecological footprint in Turkey. *Environmental Science and Pollution Research International, 27(32)*(PMID: 32656759), 40109-40120. doi:DOI: 10.1007/s11356-020-09937-0

Dogan E, Ulucak R, Kocak E, Isik C (2020) The use of ecological footprint in estimating the

environmental Kuznets curve hypothesis for BRICST by considering cross-section

dependence and heterogeneity. Sci Total Environ 723:138063. https://doi.org/10.1016/j.

scitotenv.2020.138063

Edwards, T. (2020). Measuring net environmental impact from population growth and alternative energy. *The Journal of Population and Sustainability, Vol. 4 No. 2 (2020)*. doi:https://doi.org/10.3197/jps.2020.4.2.67

Gao et al. (2022). Green technology innovation and carbon emissions nexus in China: Does industrial structure upgrading matter? *Frontiers in Psychology*, https://doi.org/10.3389/fpsyg.2022.951172.

George Babington Amegavi, Z. L. (n.d.). The dynamic relationship between economic globalisation, institutional quality, and ecological footprint: Evidence from Ghana. *The Journal of International Trade & Economic Development, 31:6*, 876-893. doi:DOI: 10.1080/09638199.2022.2033303

Global Footprint Network. (2020). National footprint accounts, 2019 edition. https://www.data.
 footprintnetwork.org

Godil, D. I., Sharif, A., Rafique S. and Jermsittiparsert (2021). Investigate the role of technology innovation and renewable energy in reducing transport sector CO2 emission in

China: A path toward sustainable development. Sustainable Development, 29(4), 694–707.

Guan C., Rani T., Yueqiang Z., Ajaz T. & Haseki M. I. (2022) Impact of tourism industry, globalization, and technology innovation on ecological footprints in G-10

countries, Economic Research-Ekonomska
Istraživanja, DOI: 10.1080/1331677X.2022.2052337

Gupta M., SainiS., SahooM. (2022). Determinants of ecological footprint and PM2.5: Role of

urbanization, natural resources and technological innovation,Environmental Challenges,Volume 7,2022,100467,ISSN 2667-

0100, https://doi.org/10.1016/j.envc.2022.100467.

GÜVEN, G. B. (2022). The role of tourism, energy consumption, urbanization, and economic growth on ecological footprint: The Turkish case. *European Journal of Science and Technology*(Issue 38), 440 - 449. doi:https://doi.org/10.31590/ejosat.1030941

Khan, I., & Hou, F. (2021). The dynamic links among energy consumption, tourism growth, and the
 ecological footprint: The role of environmental quality in 38 IEA countries. Environmental
Science and Pollution Research International, 28(5), 5049–5062.

Khan, Z., Ali, M., Kirikkaleli, D., Wahab, S., & Jiao, Z. (2020). The impact of technological
 innovation and public-private partnership investment on sustainable environment in China:
 Consumption-based carbon emissions analysis. Sustainable Development, 28(5), 1317–1330.
 https://doi.org/10.1002/sd.2086 Kihombo, S., Ahmed, Z., Chen, S., Ad

Kongbuamai N, Zafar M.W., Zaidi SAH, Liu Y. Determinants of the ecological footprint in Thailand: the
 influences of tourism, trade openness, and population density. Environ Sci Pollut Res Int.
 2020 Nov;27(32):40171-40186. doi: 10.1007/s11356-020-09977-6. Epub 2020 Jul 13. PMID:
 32661973.

Liu Yaping, S. F. (2022). Does tourism development, energy consumption, trade openness and economic growth matters for ecological footprint: Testing the Environmental Kuznets Curve and pollution haven hypothesis for Pakistan. *Energy, 25(C)*. doi:DOI: 10.1016/j.energy.2022.123208

LiXu, X. ,. (2022). Does technological advancement impede ecological footprint level? The role of natural resources prices volatility, foreign direct investment and renewable energy in China. *Resources Policy, 76*. doi:https://doi.org/10.1016/j.resourpol.2022.102559

Loayza, N.V. and Rancière, R. (2006). Financial Development, Financial Fragility, and Growth.
 ournal of Money, Credit and Banking, 38(4), 1051-1076.

Manga, M. A. (2021). Technological innovation, financialization, and ecological footprint: evidence from BEM economies. *Environmental Science and Pollution Research*, 28, pages21991–22001 (2021). doi:https://doi.org/10.1007/s11356-020-11845-2

Mohini Gupta, S. S. (2022). Determinants of ecological footprint and PM2.5: Role of urbanization, natural resources and technological innovation. *Environmental Challenges, 7*. doi:https://doi.org/10.1016/j.envc.2022.100467

Nathaniel, S. P., Barua, S., & Ahmed, Z. (2021a). What drives ecological footprint in top ten tourist
      destinations? Evidence from advanced panel techniques. Environmental Science and
      Pollution Research, 28(28), 38322. https://doi.org/10.1007/s11356-021-13389-5
Nathaniel, S. P., Murshed, M., & Bassim, M. (2021b). The nexus between economic growth, energy
      use, international trade and ecological footprints: The role of environmental regulations in
      N11 countries. Energy, Ecology and Environment, 6(6), 496. https://doi.org/10.1007/
      s40974-020-00205-y
Pata, U. K. (2021). Linking renewable energy, globalization, agriculture, CO2 emissions and
      ecological footprint in BRIC countries: A sustainability perspective. Renewable Energy, 173,
      197–208. https://doi.org/10.1016/j.renene.2021.03.125
Razzaq, A., Fatima, T., & Murshed, M. (2021a). Asymmetric effects of tourism development
      and green innovation on economic growth and carbon emissions in Top 10 GDP Countries.
      Journal of Environmental Planning and Management, 1–30. https://doi.org/10.1080/
      09640568.2021.1990029
Rehman A., R. M. (2022). The Impact of Globalization, Energy Use and Trade on Ecological Footprint of Pakistan: Does Environmental Sustainability Exist? *Energies, 14(17)*(5234). doi:http

Sabir, S. a. (2019, 11 01). The impact of globalization on ecological footprint: empirical evidence from the South Asian countries. *Environmental Science and Pollution Research, 26*(32), 1614-7499. doi:10.1007/s11356-019-06458-3

Saleem H.,Jiandong w., Zaman K., Elsherbini E. E., Shoukry A. M. (2018) The impact of air-railways
      transportation, energy demand, bilateral aid flows, and population density on environmental degradation: Evidence from a panel of next-11 countries,Transportation Research Part D: Transport and Environment,Volume 62,2018,Pages 152-168,ISSN 1361-9209,https://doi.org/10.1016/j.trd.2018.02.016.

Salih Katircioglu, K. K. (2018). Testing the role of tourism development in ecological footprint quality: evidence from top 10 tourist destinations. *National Library of Medicine, Nov;25(33)*, 33611-33619. doi:DOI: 10.1007/s11356-018-3324-0

Sarkodie, S. A. (2021). Environmental performance, biocapacity, carbon & ecological footprint of
nations: Drivers, trends and mitigation options. The Science of the Total Environment, 751,
141912.

Saud, S., Chen, S., & Haseeb, A. (2020). The role of financial development and globalization
in the environment: Accounting ecological footprint indicators for selected one-belt-one-
road initiative countries. Journal of Cleaner Production, 250, 119518.

Sciubba, H. W. (2019). The Effect of Population Growth on the Environment: Evidence from European Regions. *European Journal of Population, 35(2)*(2018 Apr 9), 379–402. doi:doi: 10.1007/s10680-018-9486-0

Tao, R., Umar, M., Naseer, A., & Razi, U. (2021). The dynamic effect of eco-innovation and
environmental taxes on carbon neutrality target in emerging seven (E7) economies. Journal
of Environmental Management, 299, 113525.

World Bank (2020) World development indicators. https://data. worldbank.org/. Accessed 15 Apr 2019

Xiaojuan L. MeoM., S., N. A. (2022). Effects of Inbound Tourism on the Ecological Footprint. An Application of an Innovative Dynamic Panel Threshold Model. *Frontiers in Environmental Science*, https://doi.org/10.3389/fenvs.2022.910999.

Yang X., N. L. (2021). Study on the long-term and short-term effects of globalization and population aging on ecological footprint in OECD countries. *Ecological Complexity, Volume 47*(SSN 1476-945X). doi:https://doi.org/10.1016/j.ecocom.2021.100946

Zhang, S., & Liu, X. (2019). The roles of international tourism and renewable energy in environment:
New evidence from Asian countries. Renewable Energy, 139, 385–394. https://doi.
org/10.1016/j.renene.2019.02.046

Literature Review of Solar Photovoltaic Adoption Behavior Research: A detailed Scientometric Analysis (1978-2022)

* Hafiz Jawad Hassan ** Malik Irfan Qasim

Abstract: This literature review investigates the Solar Photovoltaic (SPV) adoption behavior in households within the context of achieving Sustainable Development Goals (SDGs) and the global transition to Renewable Energy (RE) systems. From 1978 to 2022, the study addresses gaps in existing research through scientometric analysis, employing bibliometric-R packages and Biblioshiny. Analysis of 276 selected articles reveals an evolving trend in SPV adoption research, with a significant increase in publications from 2010 onwards. The USA leads in publications, followed by China, Germany, Australia, Italy, and India. Social sciences constitute 40.2% of the research, while business management, economics, and decision sciences also contribute substantially. This research results also highlighted the most cited authors and the most relevant journals. Evolutionary trends show an intensifying focus on SPV adoption, with variations in citation patterns over time. The study employs keyword co-occurrence analysis and a topic dendrogram to elucidate research themes, providing valuable insights for academics and practitioners. Despite limitations in database selection and the inductive approach, the research contributes to a significant understanding of SPV adoption behavior and suggests avenues for future exploration and refinement.

1 Introduction

SDGs, SPV, and households

The transition towards Renewable Energy (RE) systems has guided the pursuit of Sustainable Development Goals (SDG). In this pursuit, the Governments are committed to putting substantial efforts into successful

*hmeer11@gmail.com
PhD Scholar at Department of Business and Management Sciences, Superior University, Lahore.
**miqnadra@gmail.com
PhD Scholar at Department of Business and Management Sciences, Superior University, Lahore.

RE transformation of commercial, transportation, and industrial sectors (Hafezi & Alipour, 2021; Alipour et al., 2019). Solar Photovoltaic (SPV) technology is the single largest potential source and the key player in the RE transition (IEA 2019; Alipour et al., 2019). From 2010 onwards the deployment of SPV as a low-carbon RE solution has witnessed remarkable exponential growth. Specifically, there has been a staggering 2078% increase in the electricity generation segment globally, surging from 32 TWh in 2010 to an impressive 697 TWh by 2019. Furthermore, this trajectory is anticipated to align with SDGs, with a projected 2732 TWh of electricity generation by the year 2030 (IEA, 2019). In the pursuit of sustainable development, households emerge as a pivotal target group, urging governments to recognize their newfound role as a significant market segment (Alipour & Sheykhan, 2017). These households play a crucial role in shaping policy decisions to fulfill SDGs through RE deployment (Agnew & Dargusch, 2015).

1.2 Research Objectives

Researchers have extensively explored various parameters to predict and shed light on household decision-making behavior concerning SPV adoption. For instance, Wolske et al. (2017) dig into the predictors of SPV adoption, considering environmental benefits, consumer goods, and innovative decision perspectives. Recent reviews on SPV adoption-related themes have primarily centered around technical challenges and corresponding measures (Luthander et al., 2015; Haque & Wolfs, 2017). Despite these efforts, the existing literature on SPV adoption behaviors remains largely unsatisfactory (Hafezi & Alipour, 2021). Examining Solar Photovoltaic (SPV) adoption behavior through scientometric tools is an exciting concept to enhance our understanding and track research trends in the SPV adoption and consumer behavior domain. This study addresses a significant research gap by employing scientometric analysis and bibliometric coupling to deepen and enhance the understanding of SPV adoption behavior research. The focus spans five decades (1978–2022), aiming for a comprehensive exploration of the field. The research objectives involve identifying key contributors, including scholars, establishments, and nations involved in SPV adoption behavior research.

It also examines international collaboration patterns through authorship configurations and analyzes global publication and citation trends.

1.3 Research Significance

This research holds significant implications for advancing understanding and guiding action in the realm of Solar Photovoltaic (SPV) adoption behavior. By systematically analyzing five decades of literature (1978-2022) through scientometric tools, the study not only fills existing gaps in SPV adoption research but also provides a comprehensive resource for scholars, policymakers, and practitioners. The identification of key contributors, including authors and countries, facilitates collaboration and knowledge exchange. The evolution of research trends over time, coupled with insights into publication patterns and highly cited works, offers a valuable historical context for developing SPV adoption behavior research. The focus on household behavior as a pivotal element in achieving Sustainable Development Goals aligns with the global imperative for sustainable energy solutions. Moreover, the detailed subject area analysis, ranging from social sciences to business management and decision sciences, highlights the interdisciplinary nature of SPV adoption research. The implications extend to guiding future research endeavors, refining methodologies, and addressing the limitations identified in the study. Ultimately, this research serves as a foundational contribution to the understanding of SPV adoption behavior, supporting informed decision-making in the pursuit of renewable energy and sustainable development objectives.

2 Research Methodology

The study conducts scientometric analysis by utilizing the Bibliometric-R package and Biblioshiny for a thorough analysis, incorporating visualizations such as word growth dynamics and topic dendrogram to elucidate the knowledge domain landscape. Scientometric analysis statistically, graphically, and quantitatively depicts the landscape of

various academic fields (Majeed & Ainin, 2020; Dominko & Verbič, 2019). Particularly. researchers in the areas of knowledge management, strategy, leadership, entrepreneurship, socioeconomic research, psychology, HRM, and organizational behavior have utilized a scientometric approach for knowledge synthesis (Zupic & Čater, 2015). Co-citation and co-occurrence analysis are the key techniques employed in scientometric analysis (Boyack & Klavans, 2010). Furthermore, bibliometric analysis facilitates scientific researchers to explore, organize, and approach large amounts of research data and makes it possible to approach, understand, and analyze past research and apprehend future research and developments (Albort-Morant & Ribeiro-Soriano, 2016). Bibliometric analysis approach is meticulous and it has been widely studied in disciplines of management (Podsakof et al., 2008), social entrepreneurship (Rey-Martí et al., 2016), education (Diem & Wolter, 2013), innovation (Chatterjee & Sahasranamam, 2018), and knowledge management (Gaviria-Marin et al., 2019), leadership (Batistič et al., 2017), and medicine (Franks et al., 2006). A scientometric analysis is driven by a quality dataset that is extracted from world-renowned databases. Databases such as Scopus, Web of Science, ScieLO, and Google Scholar compile large statistical databases for bibliometric data analysis (Archambault et al., 2009). Current research uses the Scopus database which possesses a huge range of scientific research work in the fields of business, management sciences, and economics as its main strength (Mongeon & Paul-Hus, 2016).

2.1 Selection Criteria

At the first stage, the initial search produced 1892 articles. Research regarding "SPV Adoption Behavior" from 1978 to December 2021 is analyzed in this article. In the second stage further search, limited to subject areas: social sciences, business management and accounting, economics, econometrics and finance, and decision sciences, reduced the research results to 386. Furthermore, applying the filter of only published research articles produced 276 pieces of research. The keyword search scope was within the title, abstract, and keywords to be used in the

bibliometric technique (Batistič et al., 2017). The selection criteria are shown in Table 1.

Table 1 Selection criteria for sample articles

Serial	Search Steps	Records
1	Keywords: "solar" AND "photovoltaic" OR "purchase" AND "decision" OR "adoption" AND "behavior" OR "residential" OR "renewable"	1892
2	Year limit:1978-2022, Search Scope: Title, Abstract, Keywords,	1892
3	Subject Area: Social Sciences, Business Management and Accounting, Economics Econometrics and Finance, Decision Sciences	392
4	Language limit: English	386
5	Document Type: All published articles	276

2.2 Research Design

To fulfill the objectives of this research project, a scientometric analysis of research work evolved during the period of more than four decades 1978-1990, 1991-2000, 2001-2010, and 2011-2021 is performed. The research themes with designated keywords, using keywords "solar", "photovoltaic", "purchase", "decision", "adoption", "behavior", "residential", and "renewable" were extracted to know the major trends in the field of SPV behavior among households. Scientometric analysis was performed using R-Studio software with the Biblioshiny package. To conduct bibliometric analysis a full counting method is used which has been explained in the following schema.

Stage 1: Historical evolution of themes about "Photovoltaic Adoption Behavior" among households embedded in the publications (title, abstract, keywords) in the field of business, social science, and economics.

Stage 2: Co-citation analysis, giving a brief profile of leading references which are co-cited

> **Stage 3:** Co-authorship analysis, to provide analysis of networks formed through co-authorship from different geographical regions.

> **Stage 4:** Intellectual knowledge and conceptual structures of the major contributors in the field

> **Stage 5:** Keyword Analysis

3 Data analysis and key results

3.1 Most contributing authors

Table 2 specifies the information about the top 30 leading authors (score based on most publications). Authors Wolske KS, Higgins A, Pearce JM, Sigrin B have written 3 articles each whereas Palm A, Wüstenhagen R, Palm J, Kang H-Y, Simpson G, Ahmad S, Zhang Y, Ma C, Best R, Sun L, Muñoz-Cerón E, JR, Foliente G, Guo Q, Hong T, and Yang D, have published 2 articles each.

Table 2 Authors with most number of publications

Authors	Articles
Wolske KS, Higgins A, Pearce JM, Sigrin B	3
Palm A, Wüstenhagen R, Palm J, Kang H-Y, Simpson G, Ahmad S, Zhang Y, Ma C, Best R, Sun L, Muñoz-Cerón E, Jr, Foliente G, Guo Q, Hong T, Yang D, Bruckner T, Li X, Scheller F, Schulte E, Leibowicz BD, Schelly C, Bertsch V, Zhou L, Xu X, Siluk JCM	2

Table 3 specifies the information about the most cited authors. The authors who are among the highly cited are Scarpa R and Willis K with 317 citations, Amer M and Daim TU with 242 citations, Gillingham K and Graziano M with 224 citations, Girod B, Hoppmann J, and Huenteler J with 189 citations. Furthermore, the authors who have contributed to the relevant literature are Choi J-K, Fthenakis V, Heath GA, Hsu DD, Kim HC, O'donoughue P, Sawyer P, and Turney DE with 184 citations, Palm A with 183 citations, Wolske KS with 182 citations, Dietz T, and Stern PC with 140 citations.

3.2 Evolution of publication and citations trend by year

The data analysis for year-wise annual production reveals the publication trend regarding the research on solar-based photovoltaic adoption behavior. The research slowly started in 1981 with just 1 published article and 1 article in 1982. No research was published during the years 1983 to 1992. In 1993 only 1 article was published. The publication trend began to rise during the 1990s slowly and 2000s. In the year 2010 onwards till 2021 there was a continuous rise in the number of publications. The number of publications rose to 57 in the year 2021. The evolution of publication and citation trends is shown in Table 4. The trend analysis is divided into three equal periods. Articles published from 1981-1994 show the lowest number of citations (17), citations/year (1.21), and average citations (5.7). The period of 1995-2008 shows a huge rise in the citations trend with citations rising to 229, citations/year 16.36 and an average citations score of 32.7 was also good. The citation trend rose high from 2009 to 2021 as a total of 622 citations were recorded with 44.43 citations per year but the average citation trend was reduced to 2.3 only.

Table 3 Authors Impact with most cited authors.

Authors	Citations	Articles	Citations/article
Scarpa R	317	1	317

Willis K	317	1	317
Amer M	242	1	242
Daim TU	242	1	242
Gillingham K	224	1	224
Graziano M	224	1	224
Girod B	189	1	189
Hoppmann J	189	1	189
Huenteler J	189	1	189
Choi JK	184	1	184
Fthenakis V	184	1	184
Heath GA	184	1	184
Hsu DD	184	1	184
Kim HC	184	1	184
O'donoughue P	184	1	184
Sawyer P	184	1	184
Turney DE	184	1	184
Palm A	183	2	91.5
Wolske KS	182	3	60.7
Dietz T	140	1	140
Stern PC	140	1	140

Table 4 Evolution of articles, citations trend, and citations/year

Period	1981-1994	1995-2008	2009-2022
Results-Articles	3	7	266
Total Citations	17	229	622
Results/year	0.21	0.50	19.00
Citations/year	1.21	16.36	44.43
Average Citations	5.7	32.7	2.3

3.3 Analysis by country

Table 5 shows that the USA has produced the most number of publications preceded by China, Germany, Australia, Italy, and India.

**Table 5 Country-wise spread of publications**

Country	Articles
USA	181
China	88
Germany	47
Australia	44
Italy	43
India	38
Spain	37
Brazil	33
Iran	28
South Korea	24
UK	20

3.4 Analysis by Subject Area

Figure 1 shows the common research areas in the field of photovoltaic adoption behavior. The social sciences area is at the top with 40.2% of the total research work, business management contributes 30.1%, economics and econometrics contributes 15.5% and the decision sciences area contributes 14.2%.

Figure 1 Key domains -subject areas
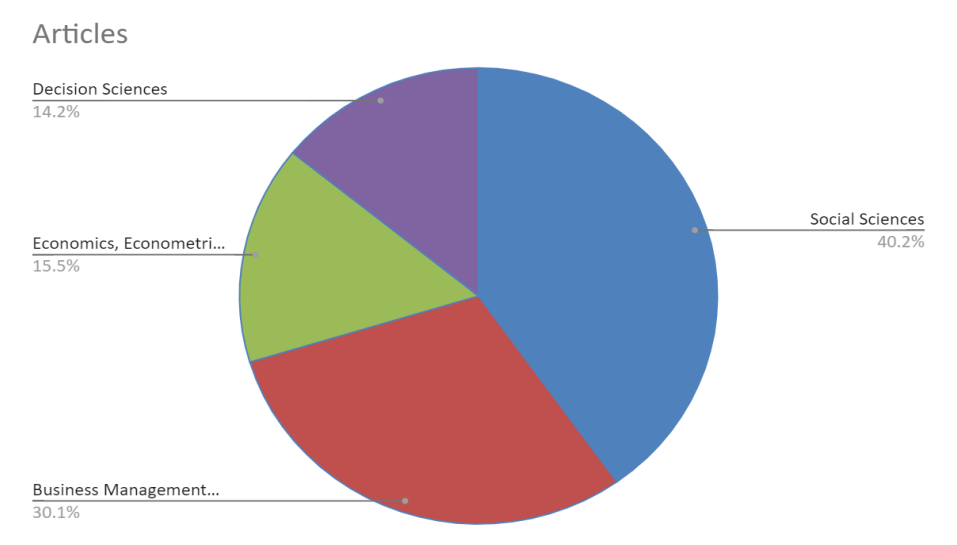
3.5 Analysis by source (Journals)

Table 6 shows the most productive journals. The most productive journals are the Journal of Cleaner Production with 39 articles, Sustainability with 34 articles, Energy Research and Social Science with 16 articles, and Energy Economics with 15 articles. Other journals in the list have published 10 or less than 10 articles.

3.6 Mapping Analysis

Keyword co-occurrence analysis as shown in Figure 2 (Treemap) is used to classify the succeeding themes in photovoltaic adoption behavior research. Figure 2 shows the larger occurrence for the keywords with higher frequency and vice versa. The presentation of keyword frequency in the form of a tree map helps the researchers to identify key research areas and the subsequent gaps for further research debates. The hierarchy of data sets is based on color combinations, size, and dimensions of the cubes in the tree map. The treemap highlights the combination of keywords signifying the research in the relevant field.

Table 6 List sources-journals with the most number of articles

Sources	Articles
Journal of cleaner production	39
Sustainability (Switzerland)	34
Energy research and social science	16
Energy economics	15
Energy for sustainable development	10
Technological forecasting and social change	10
Sustainable cities and society	8
International journal of energy sector management	5
Ecological economics	4
International journal of energy economics and policy	4

3.7 Topic Dendrogram

Another cluster analysis is performed to reveal the similarities and dissimilarities between the classified objects. A complete dendrogram presents such classification through a dendrogram. A dendrogram facilitates the researcher to evaluate the estimated number of clusters but it restricts to discovery of the perfect association among these clusters (Andrews, 2003). The horizontal axis represents the dissimilarity among the clusters and the vertical lines represent the pooled topics. The dendrogram is divided into two strands with maximum developments and divisions. Each block clusters different areas of interest.

Figure 2 Tree maps of themes

4 Conclusion and recommendations

4.1 Conclusion and discussion

Research on photovoltaic adoption behavior continues to nurture several study and research disciplines and countries with solid roots in business management academic research. The current study covers the largest sample (1978-2022) of published research on SPV adoption behaviors of households as suggested a huge gap by (Alipour et al., 2020) through scientometric analysis to statistically and quantitatively show the landscapes of different research fields in academics just like the studies performed by (Majeed & Ainin, 2020; Dominko & Verbič, 2019). Previously, the seminal works of (Alipour et al., 2020) and (Alipour et al., 2021) have not only synthesized the collection and combinations of various predictors but also developed a taxonomy of these predictors to affect SPV adoption behaviors. The review work done by (Wolske et al., 2017) has also synthesized the SPV adoption literature within the context of behavioral theories. Previously, a diversity of quantitative and qualitative techniques, methodologies, and methods edified a huge pile of literature that raises adequate space for stocktaking for future research. Modern tendencies in research on SPV adoption behaviors have urged to establishment of a methodological and succinct review. Currently, synthesizing the research on SPV adoption behavior has given valuable insights to academics, and practitioners. This research article has quantitatively presented the research leads, sources, collaborations, and origins that have been adored by the research community while doing the SPV adoption behavior research. Current research is an effort to trace this progression through the historical context (1978-2022) by distinguishing the most influential authors, journals, organizations, and countries. This methodology can be replicated, to sum up the advanced knowledge and research in various business research fields and is particularly relevant for the researchers dedicated to the field of SPV adoption behaviors.

4.2 Limitations

Although this research covers a comprehensive datasets with an ample span of years, still it engulfs some perceptible limitations. The selection criteria for subject area and document type raise the principal constraint in the research design. Nevertheless, this limitation in the meanwhile offers room for future research endeavors by setting an enlarged selection criterion to extract the sample articles from Scopus or any other database. Furthermore, we conducted this research with an inductive approach accompanying an objective stance to have rich findings through raw data. This research is limited to finding its primary objective of exploring the evolution and development of photovoltaic adoption behavior research. In this pursuit, the inquiry about macro contextual factors in this domain with a multidisciplinary approach is still unheard of and can be rediscovered with the same sample size. In co-authorship instances, the deep insight into the social ties among the authors is not included in the scope of this research. This limitation can be worked on in the future for further understanding of intellectual advancement and social linkage of authors and shared working experiences among authors. The evolution progress of SPV adoption behaviors is demonstrated against the criterion of specific time zones. This limitation can be further addressed in the future through a fine-grained criterion of sub-themes, and keywords.

4.3 Implications and future research directions

From an academic point of view this study can guide the researchers well to witness the dynamic changes in the mentioned domain through distinguished representations and models. Bibliometric with science mapping has helped the researcher to distinguish leading authors, most productive journals, and most researched themes in the research domain of solar-based renewable energy adoption decisions. The bibliometric analysis has also figured out the most cited authors, journals, databases, and the evolution of research themes within the timeline of 1978-2022. Database limitation affects the basics of bibliometric analyses i.e. bibliometric coupling, science mappings, co-citation analysis, etc. By delimiting the database selection choice the basic results of bibliometric

analysis can give altogether a different picture of revolution progress in the relevant field. Finally, future research can focus on a practitioner-focused approach which will be a nice move towards practitioner achievement from the academic dialogues.

References

Agnew, S., & Dargusch, P. (2015). Effect of residential solar and storage on centralized electricity supply systems. *Nature Climate Change*, *5*(4), 315-318.

Albort-Morant, G., & Ribeiro-Soriano, D. (2016). A bibliometric analysis of international impact of business incubators. *Journal of Business Research*, *69*(5), 1775-1779.

Alipour, M., & Sheykhan, A. (2017). A vision for Iran's fuel cell and hydrogen development. *International journal of environmental science and technology*, *14*(1), 193-210.

Alipour, M., Hafezi, R., Papageorgiou, E., Hafezi, M., & Alipour, M. (2019). Characteristics and scenarios of solar energy development in Iran: Fuzzy cognitive map-based approach. *Renewable and Sustainable Energy Reviews*, *116*, 109410.

Alipour, M., Hafezi, R., Papageorgiou, E., Hafezi, M., & Alipour, M. (2019). Characteristics and scenarios of solar energy development in Iran: Fuzzy cognitive map-based approach. *Renewable and Sustainable Energy Reviews*, *116*, 109410.

Alipour, M., Salim, H., Stewart, R. A., & Sahin, O. (2021). Residential solar photovoltaic adoption behaviour: End-to-end review of theories, methods and approaches. *Renewable Energy*, *170*, 471-486.

Andrews, J. E. (2003). An author co-citation analysis of medical informatics. *Journal of the Medical Library Association*, *91*(1), 47.

Archambault, É., Campbell, D., Gingras, Y., & Larivière, V. (2009). Comparing bibliometric statistics obtained from the Web of Science and Scopus. *Journal of the American society for information science and technology*, *60*(7), 1320-1326.

Batistič, S., Černe, M., & Vogel, B. (2017). Just how multi-level is leadership research? A document co-citation analysis 1980–2013 on leadership constructs and outcomes. *The Leadership Quarterly*, *28*(1), 86-103.

Boyack, K. W., & Klavans, R. (2010). Co-citation analysis, bibliographic coupling, and direct citation: Which citation approach represents the research front most accurately?. *Journal of the American Society for information Science and Technology*, *61*(12), 2389-2404.

Chatterjee, D., & Sahasranamam, S. (2018). Technological innovation research in China and India: A bibliometric analysis for the period 1991–2015. *Management and Organization Review*, *14*(1), 179-221.

Demiroz, F., & Haase, T. W. (2019). The concept of resilience: a bibliometric analysis of the emergency and disaster management literature. *Local government studies*, *45*(3), 308-327.

Diem, A., & Wolter, S. C. (2013). The use of bibliometrics to measure research performance in education sciences. *Research in higher education*, *54*(1), 86-114.

Dominko, M., & Verbič, M. (2019). Subjective well-being among the elderly: a bibliometric analysis. *Quality & Quantity*, *53*(3), 1187-1207.

Franks, A. L., Simoes, E. J., Singh, R., & Gray, B. S. (2006). Assessing prevention research impact: a bibliometric analysis. *American Journal of Preventive Medicine*, *30*(3), 211-216.

Gaviria-Marin, M., Merigó, J. M., & Baier-Fuentes, H. (2019). Knowledge management: A global examination based on bibliometric analysis. *Technological Forecasting and Social Change*, *140*, 194-220.

Hafezi, R., & Alipour, M. (2021). Renewable Energy Sources: Traditional and Modern-Age Technologies. In Affordable and clean energy (pp. 1085-1099). Cham: Springer International Publishing.

Haque, M. M., & Wolfs, P. (2016). A review of high PV penetrations in LV distribution networks: Present status, impacts and mitigation measures. Renewable and Sustainable Energy Reviews, 62, 1195-1208.

https://www.iea.org/renewables2019/, 2019.

IEA, Global solar PV market set for spectacular growth over next 5 years. https://www.iea.org/newsroom/news/2019/october/global-solar-pvmarket-set-for-spectacular-growth-over-next-5-years.html, 2019.

IEA, Renewables, Market analysis and forecast from 2019 to 2024, 2019.\

Jiang, Y., Ritchie, B. W., & Benckendorff, P. (2019). Bibliometric visualisation: An application in tourism crisis and disaster management research. *Current Issues in Tourism*, *22*(16), 1925-1957.

Luthander, R., Widén, J., Nilsson, D., & Palm, J. (2015). Photovoltaic self-consumption in buildings: A review. Applied energy, 142, 80-94.

Majeed, N., & Ainin, S. (2021). Visualizing the evolution and landscape of socio-economic impact research. *Quality & Quantity*, *55*(2), 637-659.

McPherson, M., Smith-Lovin, L., & Cook, J. M. (2001). Birds of a feather: Homophily in social networks. *Annual review of sociology*, 415-444.

Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: a comparative analysis. *Scientometrics*, *106*(1), 213-228.

Podsakoff, P. M., MacKenzie, S. B., Podsakoff, N. P., & Bachrach, D. G. (2008). Scholarly influence in the field of management: A bibliometric analysis of the determinants of university and author impact in the management literature in the past quarter century. *Journal of Management*, *34*(4), 641-720.

Rey-Martí, A., Ribeiro-Soriano, D., & Palacios-Marqués, D. (2016). A bibliometric analysis of social entrepreneurship. *Journal of business research*, *69*(5), 1651-1655.

Soundararajan, K., Ho, H. K., & Su, B. (2014). Sankey diagram framework for energy and exergy flows. *Applied energy*, *136*, 1035-1042.

Wolske, K. S., Stern, P. C., & Dietz, T. (2017). Explaining interest in adopting residential solar photovoltaic systems in the United States: Toward an integration of behavioral theories. *Energy research & social science*, *25*, 134-151.

Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational research methods*, *18*(3), 429-472.

Social Conflict and Preferences for Redistribution in Pakistan

*Muhammad Hanif **Muhammad Awais ***Muhammad Zeeshan Younas

Abstract: The unequal power dynamics and income disparities prevalent in democratic developing nations, like Pakistan, fuel various social conflicts that adversely affect economic development. This study aims to investigate the impact of social conflict on individual preferences for redistribution. Data from the World Value Survey (WVS) is utilized for this purpose. The findings indicate a significant association between a high degree of social conflict and increased preference for redistribution, particularly when examining individual characteristics related to both preferences for redistribution and social conflict. Further analysis reveals that individuals' perceptions and preferences toward redistribution exhibit a tendency to evolve over time. Moreover, the study explores how individuals' perceptions of wide income disparities correlate with heightened support for redistribution.

Keywords: Social Conflict, Preference for Redistribution, Income Differences

1 Introduction

Political economy literature has established facts that the presence and persistence of conflict and inequality affect every nation specifically

*School of Economics, Quaid-I-Azam University Islamabad, Email:HFraza99@gmail.com
**Department of Economics, Kohat University of Science and Technology (KUST), Kohat, Pakistan, Email: Muhammad.awais@kust.edu.pk
***School of Economics, Quaid-I-Azam University Islamabad, Email: mzeeshan@eco.qau.edu.pk

modern democratic nations (Jan & Rizwan, 2023).[1] It may raise many questions about the effectiveness of the democratic system of government (Acheampong et al., 2023). Every democratic government tries to reduce the problem of conflict and inequality through redistributive policies. Therefore, Meltzer and Richard (1981) proposed that if the distribution of income is skewed then the medium constituent hypothesis allows poor individuals to redistribute the income of rich individuals to themselves. As a result, the extensions of voting rights modify the economic situation of decisive voters in the redistribution. Likewise, Acemoglu and Robinson (2000) presented a hypothetical model signifying that government leads to socioeconomic and political amendments to move up redistributive policies through voting rights to decrease social disorder and revolution in society.[2]

Several studies have analyzed the historical political reforms from an oligarchy run by an elite to a democratic system from an economic perspective (Laursen & Vanhoonacker, 2023; Nastain et al., 2024). According to Acemoglu and Robinson (2000), the most important cause for the political reforms is "the elite extended the franchise in order to avoid social unrest". Similarly, North et al. (2009) scrutinize that political reforms are not merely significant towards income redistribution but correspondingly towards the endowment of communal commodities which remain harmonizing to the marketplace. Nowadays, the majority of countries are facing a democratic system. Nevertheless, the perception of conflict and inequality still exists inside democratic countries.

There is a plethora of empirical literature available on social conflict and preference redistribution which report mixed findings (Edwards, 2011; Yamamura, 2016; Cohn et al., 2023; Tucker & Xu, 2023; Gassmann & Timár, 2024). A seminal contribution in this regard is made by Yamamura (2016) which concludes that people in nations with high observed conflict between poor and rich have a higher probability of supporting income distribution, particularly high-income earners. Another

[1] On this debate, see the following studies (Rodrik, 1999; Corneo & Gruner, 2000; Acemoglu and Robinson, 2000; Adachi & Nakamura, 2008; Yamamura, 2012; Edwards, 2012; Bloedel, 2014).

[2] Acemoglu and Robinson (2000) analysis based on mediam electoral model of Meltzer and Richard (1981).

study conducted by Duell (2015) indicates that redistribution preferences can vary non-linearly based on group heterogeneity and the priming of group conflicts. A recent attempt by Lierse (2022) further complicated the analysis by highlighting that conventional socioeconomic divisions in redistributive preferences are weakened by varying mobility expectations, with the middle class being specifically indifferent. Edwards (2011) argued the idea that mandatory income redistribution can alleviate social conflict, proposing that it may, in fact, intensify it. This strand of literature mutually focuses on the complicated and manifold kind of bond between social conflict and preferences for redistribution.

The following literature shows that social disorder in democratic countries triggered by the unfair distribution of resources seems to creep up the situation of rich individuals (Yamamura, 2015), and (Justino and Verwimp, 2013) also analyzed the effect of several conflicts comprising genocide and domestic conflict, numerous citizens displaced from their homes and lands and mostly individuals who were land well-off before the conflict in Rwanda between 1990 and 2000. As a result, prosperous provinces experienced detrimental economic progress after the conflict. This proposes that rich people lose their assets due to the deficiency in the existing democratic system. Therefore, well-off individuals have an inducement to promote the democratic system to keep away from such misfortunes.

Research on conflicts finds detrimental effects in terms of economic and social development. These negative effects range from destruction of livelihoods and markets (Fearon and Laitin, 2003), enlargements in the risk probability of investment (Barron *et.al*., 2004), high poverty (Midlarsky, 1988; Boswell and Dixon, 1990), loss of trust between economic agents and the waste of significant human and economic resources (Boix, 2003), low economic growth (Stewart *et.al.,* 2001), to loss of employment and human capital (Gupta, 2004). Besides this, conflict persistence also affects government redistribution policies in democracies.[3] Moreover, social conflict is supposed to affect perceived

---

[3]Justino (2004), Edwards (2012) and Yamamura (2015) explore the impact of social conflict on redistribution policies and find that redistribution policies have been necessary in order to reducing social conflict.

income variances and individuals' preferences for redistribution policy (Voors et al. 2012).[4]

Substitute options available to put off social discontent or counterbalance prevailing social conflicts are renovated social redistributive policies that permit to transmission of resources towards appropriate individuals. At the same time, social conflict is caused by discrepancies among mutual groups as well as the determination of communal segregation beside economic, social otherwise political outcomes, a successful form of putting off the happening of social conflict is due to redistributive policy (Keefer and Knack, 1995; Alesina and Perotti, 1996; Collier and Hoeffler, 2000). Furthermore, redistribution policies may comprise a significant setup for the administration of social conflict, as well as redistributive policies will also defend individuals against losses of earnings plus essential facilities, as a result raising the possible costs of these individuals engaging in such social conflicts (Cashin, 1995; Masson, 1996; Boix, 2004).

The above discussion figures out that those preferences for redistribution, like government redistribution policies, are crucial for the socioeconomic development of a country or society. Nonetheless, empirical research on the aspects that have detrimental effects on preferences for redistributive policies is partial. Primarily, how social conflicts affect preferences for government redistribution policies is still a significant investigation. Therefore, it is essential to analyze empirically the impact of such conflict by concentrating on redistributive policies in the 21st era.

Therefore, this study examines how social conflicts among individuals interact with preferences for government redistribution policies in Pakistan. Since Pakistan is a developing country and facing these problems. Pakistan is a diverse country both in terms of religion and culture (Majeed, 2003), also diverse in terms of social, economic, and political, and diversity have enormous pressure on the social and political cohesion of Pakistan. These forces have been affected by clashes between ethnic, different castes, and religious groups, as a retort to inequalities in the distribution of occupation conditions, social services, access to land,

---

[4]This study experimentally estimated the impacts of conflicts on viewpoints about discount rates. Additionally, they presented indication that conflict demonstrates unselfish actions towards their neighbors.

institutional power, and other assets (Mehmood & Idrees, 2010; Waseem, 2011). To formulate this analysis, we utilize the data given by the World Value Survey (WVS) for both the construction of social conflict and preferences for redistribution. To our knowledge, no study explicitly evaluates the impact of social conflicts on preferences for redistribution in the case of Pakistan.

The rest of the study is structured as follows. Section 2 presents comprehensive literature on social conflict and preferences for redistribution from various perspectives. Section 3, discusses the data and variables of the study. Section 4 presents the econometric strategy, whereas Section 5 explains the results and discussion of the study. Finally, section 6 provides a conclusion of the study.

2 Literature Review

There is an enormous body of literature available on social conflict and preferences for redistribution over time and regions (Klor & Shayo, 2010; Edwards, 2011; Yamamura, 2016; Schokkaert & Truyts, 2017; Cohn et al., 2023; Tucker & Xu, 2023; Gassmann & Timár, 2024). This section documents the literature on social conflict and preferences for redistribution from the following perspectives. Firstly, we investigate literature on the following questions on preferences for redistribution from different aspects: where do different preferences for redistribution come from? How do individuals prefer redistribution and why? Secondly, we overview the literature that explores the socioeconomic impacts of social conflict and income variation on redistribution preferences.

To start with a general view, social scientists examined where various preferences for redistribution come from. Or whether political elite redistribution has been fair from the rich individual to the poor individual. Therefore, answering these questions positively is a significant and challenging task. A scarce number of studies have been examined from the literature: As Giuliano and Spilimbergo (2008) point out those individuals with misery and misfortunes in the past may have different preferences and behaviors than others. For example, individuals with a history of misfortune in the past are supposed to be extra risk-averse and less hopeful around their forthcoming increasing mobility,[5] more disposed

---

[5]Prospect of Upward Mobility (POUM) Theory, "people who expect to move up the

to balance their income, in particular to past events such as the Great Depression. In line with this literature, Gartner *et.al* (2017) found that redistribution policies can give protection against upcoming adverse economic shocks. This indicates that an individual's preferences toward redistribution are anticipated to raise risk aversion. Similarly, Alesina and Glaeser (2004) analyze the comparison between Europe and the United States (US) cultures and suggest that the role of culture is also important in devising the relative merits of equality versus individualism. Therefore, various historical experiences in various countries can lead to numerous social norms around inequality.

In particular, indoctrination may influence people's views about government policies, as emphasized by Alesina and Schundeln (2007). For example, in terms of economic system, communalist autocracy explores that in communism the government takes comprehensive regulator over the production of goods, and all resources and goods in the society are distributed equally. The communist dictatorship affects individuals' philosophy toward market capitalism and the role of the government in giving social facilities, security, and redistribution from rich individuals to poor people. Likely, occasionally parents can consciously convey "distorted" opinions about the realism of inequality, to influence social mobility of their children's motivations (Benabou and Tirole 2005). In addition, the arrangement and structure of the family can make individuals more or less dependent, and individuals may support government involvement in distributive matters [Todd (1985); Esping Andersen (1999); Alesina and Giuliano (2007)]. Similarly, perception of fairness matters, and most individuals appear to create a difference between income attained by "luck" and income attained by "effort" and this division matters in determining preferences for redistribution [Alesina and Glaeser (2004); Alesina and Angeletos (2005)].

Pieces of literature document how and why people have a preference for redistribution. For example, the economic simulations of Romer (1975), Roberts (1977), and Meltzer and Richard (1981) report, that rises in inequality before the deduction of taxes on earnings leads to greater political preference toward redistributive policies. Similarly, Piketty (1995) claims that the effect of societal mobility is both on individuals'

income scale are unlikely to   support a redistribution policy even when they are currently poor"(Benabou and Ok 2001).

political attitudes and aggregate political attitudes toward redistribution. Although rich individuals are less prospective towards redistributive policies but poor individuals have greater attitudes towards the redistribution policy. At the aggregate level, redistributive preferences fluctuate across the states. Following these arguments, Alesina et al. (2001) and Alesina and Glaeser (2004) examined that people in Europe tend to have stronger redistributive preferences than the US. In line with this literature, at the aggregate level, Corneo and Gruner (2002) estimate the descriptive power of three challenging forces, firstly referred to as 'homoeconomicus effect' is considered redistributive tax-transfer schemes. The redistributive tax-transfer schemes affect the individual's net income. Secondly, Arrow (1963), explored the 'public values effect' that people could be capable with a social welfare function that states their preferences over resource distributions to all individuals in society. Social Welfare Function can reflect an individual's approaches towards government redistribution. Thirdly, the 'social rivalry effect' is considered Individual's preference for redistribution depends on the comparative living standard of the individual, these forces determine an individual attitude toward government redistribution.

In addition, Alesina and La Ferrara (2005), Rainer and Siedler (2008), and Alesina and Giuliano (2009) explored the "prospect of upward mobility" (POUM) hypothesis is a specific case in opinion: not entire presently poor individuals will demand redistribution strategy that excessively tax higher incomes because they might anticipate moving up in the income measure and consequently be offended by such strategy. In the same way, not only entire currently rich individuals will be unfavorable towards sizable taxation at the uppermost of the income distribution because of the panic of descending mobility.

A substantial number of previous studies have examined those preferences for redistribution that are affected by income inequality from both micro and macro-level perspectives. In particular, in democracies, more unequal societies will have stronger preferences for redistribution [Romer (1975); Roberts (1977); Meltzer and Richard, 1981; Haggard *et al.* (2010); Neher (2011); Yamamura (2012); Takeuchi (2014)]. Furthermore, the latest report of the United Nations Development

Programme (UNDP)[6] highlights those opinions and ethics show a noteworthy role in modeling mutually the demand and supply dynamics that affect to decline of the political economy of inequality (Malik, 2014). Similarly, Etchebehere (2018) utilized a dataset of Uruguayan to analyze the correlation between peoples' views about their positions in the income distribution, and their preferences for redistribution and also analyzed the asymmetries between high, median, and low-income households. In this regard several empirical studies have explored a new and more recent idea has been explored which indicates that individuals' misinterpretation regarding to distribution of income and relative position, also impacts their preferences towards distribution. It has been studied, for example, by Osberg and Smeeding, (2006) the association between misunderstandings and preferences for redistribution through the distribution of income and Cruces et al. (2013), Kuziemko et al. (2015), and Albertos and Kuo (2015) utilizing survey data and randomized field research, giving the suggestion that misrepresentation shows a essential role in structuring preferences for redistribution.

Similarly, the political economy literature shows that social conflict within society has been determined by structural conflict factors like income disparity and racial diversity, and these kinds of structural conflict factors are controlled by the effectiveness of the conflict management system. The conflict management system consists of factors such as democracy maturity and the government's capacity to implement policy. For example, June (2009) examined that social conflict is generated in society because of the weak institutions of the conflict management of a country. Following these arguments, the factors of social conflict in regions using mining production. Haslam and Tanimoune (2016) found that both socio-demographic and economic factors affect significantly the likelihood of socio-environmental conflict. Likely, Castellares and Fouche (2017) examined that a rise in the global prices of crucial raw materials mined in each mine does not have a substantial outcome over the possibility of happening of social conflict in regions with mining production. Similarly, Takeuchi (2014), and Yamamura (2016) both used ISSP-2009 data and found that opinions regarding social conflict have strongly influenced the redistribution preferences of people, and their

---

[6]Accessible at: http://hdr.undp.org/en/data.

impacts have been robust from the opinions of social mobility and fairness.

In this literature, social trust has been also one of the factors due to which inequality creates these argumentative impacts on conflict and uncertainty. Therefore, inequality has been connected to less social trust in individuals in common to reflect horizontal trust Thorbecke and Charumilind (2002), UNDESA (2013)[7], Jordahl (2009) along with subordinate trust in institutes being responsible for producing the imbalanced distribution of resources are reflected in vertical trust Fischer and Torgler (2013). Once trust is smashed down thus tools of social mechanism turn into declining Kennedy et al. (1998), Kelly (2000), and resource inequality is linked through discrimination, the deterioration of the rule of law, and the need to be redistribution Melamed and Samman (2013).

Our study is also relevant to the literature on social conflict and preferences for redistribution (see, for example, Takeuchi, 2014, Yamamura, 2016). This strain of literature on redistributive policies studies the impact of social conflict on government redistribution. Our study contributes to this literature analyzing social conflict which ought to have a considerable outcome on redistribution preferences. Existing literature overlooks the nuanced interplay between preference for redistribution and key explanatory variables, such as social conflict and income differences, within the specific socio-political and economic landscape of Pakistan. Furthermore, the majority of studies in this domain have predominantly relied on cross-sectional data or have focused on developed economies, neglecting the unique challenges and complexities faced by developing nations like Pakistan.

3 Data and Variables

This section provides compendious details of the data which is a main part of the study. We utilized the comprehensive dataset of the World Value Survey (WVS), for both, the identification of preferences for redistribution, and the construction of the proxy for social conflict. The WVS has been accomplished numerous times since 1981, which provides individual-level data. The WVS has conducted a broad survey across

---

[7] https://www.un.org/en/development/desa/news/2013

individuals and across countries, where the survey is fulfilled based on a questionnaire. The WVS presents questions on beliefs and a massive set of demographic and socioeconomic variables. It carries out datasets designed together for developed and developing countries, but the number of developed countries' data is less than developing countries in the WVS. The WVS covers six waves, and each wave is reachable at an interval of five years i.e. Wave-1 from 1981 to 1984), Wave-2 from 1990 to 1994), Wave-3 from 1995 to 1998), Wave -4 from 1999 to 2004, Wave-5 from 2005 to 2009 and Wave-6 from 2010 to 2014.

The WVS provides data for Pakistan in three waves (i.e., Wave 3, wave 4 and wave 6). It is significant for the analysis that we focused on the available dataset in this study. In the subsequent section, we define and explain how focused variables of the study are conducted, followed by comprehensive descriptive statistics.

3.1   Construction of Variables

3.1.1   Preference for Redistribution: Outcome Measures

In this study, preferences for redistribution are constructed by utilizing comprehensive data provided by the World Value Survey (WVS). The preferences for redistribution are constructed from a question on the World Value Survey [118] which inquires respondents [on a scale of 1-10]: "whether they believe that the Government should take more responsibility to ensure that everyone is provided for or whether People should take more responsibility to provide for them." We construct by converting the outcome variable into a binary answer; this allows us to deem the determinants of an individual supporting a strong pro-redistributionist view. We use this specification of the dependent variable in standard Logit models.

However, this classification compares those with strong redistributive views with the rest of the population. Some respondents might be relatively indifferent or neutral on the issue while others hold strongly anti-redistribution preferences. As in the Logit, respondents choosing 1-2 on the ten-point scale are the "pro-redistribution" group. Responses 3-8 are deemed "neutral" and respondents choosing 9-10 correspond to the "anti-redistribution" or "pro-self-dependent" group. With three possible outcomes for the dependent variable, we take "pro-redistribution" as the

base outcome. We exclude the "neutral" respondents from our results as they represent weak preferences and do not provide leverage on our main theoretical concerns [Haggard *et al* (2010); Corneo and Gruner (2000)].

3.1.2   Explanatory Variable
3.1.2.1. Social Conflict:

Defining social conflict is unarguably a significant and main component of the study because the identification of social conflict is primarily based on the definition one uses. Rodrick (1999) defines "*social conflict as an indication of the pre-existing social cleavages in the society*" and identifies social conflict by using this definition. In a broader sense, we use the term social conflict to increase anxiety as well as the fall down of societal trust inside individuals. Likewise, social conflict ought to be different from civil conflict, while social conflict can encourage violence and violence is merely a single probable possibility might social conflict could mark itself. A variety of methods have been implied in previous research to identify social conflict [Knack and Keefer (1996); Ingle hart, (1994); Glaeser et al. (2000)].

Furthermore, the previous literature used two proxies for the measurement of social conflict, one is social trust and the other one is fractionalization. If we use fractionalization as a proxy for the measurement of social conflict, the whole definition gets changed with it and this will implicitly rule out and will not capture social conflict in society. Alesina *et. al.* (2002) explored that fractionalization has been changed from social conflict for the reason that fractionalization measures capture better the degree of heterogeneity. Nevertheless, the impacts of fractionalization measures ought to be performed well on development and governmental quality.

In this study, we use a proxy of social trust constructed by utilizing an inclusive dataset provided by the WVS. However, Social trust seems to be the cause of generating unfair income redistribution, and these unpleasant effects on conflict and uncertainty. Unfair income redistribution in society can contribute to weakening social trust and social instability (Kennedy & Pronin, 2008). Unfair income redistribution has been associated with lower community trust in common-horizontal trust (Thorbecke and Charumilind 2002; Jordahl 2007; UNDESA 2013; Fischer and Torgler 2013), as well as that insignificant trust in institutes responsible for

causing inequitable distribution of resources –vertical trust (Fischer and Torgler 2013). Using this data, we construct the following variable which serves as a proxy for social conflict. The variable social trust is measured from the following question of the WVS; "Generally speaking, would you say that most people can be trusted or that you cannot be too careful in dealing with people?" Meanwhile, we construct a breakdown of social trust within society by a dummy variable equal to 1 for individual i who does not respond "yes" to the above-mentioned question and 0 otherwise.

3.1.2.2.   Income Differences

Another focused explanatory variable of our study is the perception of people about Income inequality. The variable People's perceptions about income inequality are measured from a question on the World Value Survey which asks respondents [on a scale of 1-10] whether "Incomes should be made more equal" or "we need larger income differences as incentives for individual effort."[8] For our analysis, we used a dummy variable that remains equivalent to 1 for the individual if he or she agrees with the statement "We need larger income differences as incentives for individual effort" (values of 9 and 10 on the 10-point scale)[9] and 0 otherwise.

However, this classification compares those with strongly agreed views with the rest of the population. Some respondents might be relatively indifferent or neutral on the issue while others hold strongly disagreeing views. As in the logits, respondents choosing 9-10 on the ten-point scale perceived that income inequality is large among the rich and poor people. Responses 3-8 are deemed "neutral" and respondents choosing 1-2 perceived that income inequality is not large among the rich and poor people. With three possible outcomes for the dependent variable, we take "income inequality is large among the rich and poor people" as the base outcome. We exclude the "neutral" respondents from our results as they represent weak preferences and do not provide leverage on our main theoretical concerns.

---

[8][Takeuchi (2014); Haggard, et.al (2010)] use this question for the measurement of perceptions of peoples about income inequality.

[9] In the previous literature 9 and 10 scale points is recoded by 1 on the 1-10 scale points and recode zero for other scale points.
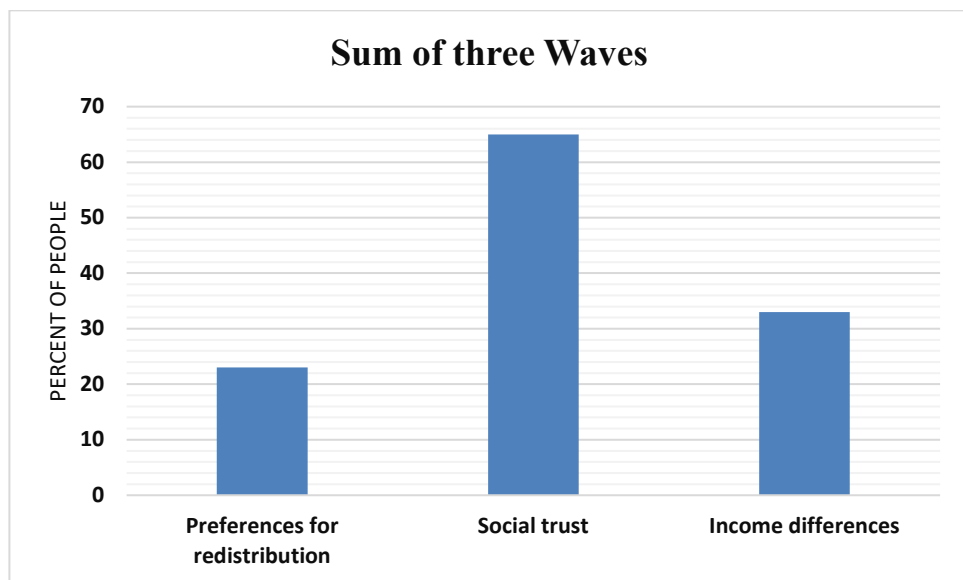
Figure 1 Summary of key variables

(Figure source: Author's construction)

Table 1 reports the descriptive statistics for key variables of our study. Additionally, table 1 (Panel A) presents descriptive statistics of preferences for redistribution, social conflict, and income differences for the whole dataset (combine observations of Wave 3, wave 4, and Wave 5), while (Panel B) reports descriptive statistics of preferences for redistribution, social conflict and income differences for each wave. Table 1(Panel A) exhibits that about 23% of individuals support government redistribution policies. Furthermore, table 1(Panel B) shows that the average number of individuals who prefer redistribution has been increasing over time from 0.19 in Wave 3 to 0.24 in Wave 6. Likewise, table 1 (Panel A) posits that about 65% of the individuals do not have social trust within society to redistribute resources fairly which means that lower social trust of people in society. Similarly, table 1(Panel B) shows that the fall down of social trust has been low in Wave 3 and Wave 6 but the proportions of social trust in Wave 4 have increased as compared to Wave 3 and Wave 6. Table 1(Panel A) shows that 33% of individuals perceived large income differences between rich and poor. Correspondingly, table 1(Panel B) provides that the average number of

individuals' perceptions about income differences have been decreasing from 33% in Wave 3 to 22% in Wave 6.

Table 1 Summary statistics for the main variables

Variables	Observations	Mean	Std. dev.	Min	Max
Panel A: Sum of three Waves					
Preferences for redistribution	3,933		.42	0	1
		0.23			
Social trust	3,933		.47	0	1
Income differences	3,933	0.65	.47	0	1
		0.33			
Panel B: For each Wave					
		Wave 3			
Preferences for redistribution	733	.19	.39	0	1
Social trust	733	.80	.39	0	1
Income differences	733	.33	.46	0	1
		Wave 4			
Preferences for redistribution	1,200	.23	.43	0	1
Social trust	1,200	.55	.49	0	1
Income differences	1,200	.32	.47	0	1
		Wave 6			
Preferences for redistribution	2,000	.24	.42	0	1
Social trust	2,000	.73	.44	0	1
Income differences	2,000	.22	.41	0	1

Note: This table provides descriptive statistics for the main variables of the study. Preferences for redistribution is outcome variable. Explanatory variables are social trust used as a proxy for social conflict and income differences.

3.1.3. Control Variables

To diminish the possibility of omitted variables bias, a choice of control variables, which potentially change both variables of interest and response variable has been incorporated in the regression analysis. Control variables include demographic, socio-economic, and political characteristics at individual levels. Demographic controls are gender, age, education, and marital status. Socio-economic characteristics include fairness, experience of mobility, and household income level. Similarly, one of the factors regarding redistribution preferences is likely political beliefs and to be controlled, while redistribution preferences are estimated (Alesina and Giuliano 2009; Yamamura 2012). Therefore, a dummy has been introduced in the regression analysis for each control variable. The summary statistics of control variables are offered in Table 2. Table 2 of panel A delivers descriptive statistics of control variables for the sum of waves, whereas panel B reports descriptive statistics of control variables for each wave.

Table 2 Summary statistics for the Control variables

Variables	Observations	Mean	Std. dev.	Min	Max
Panel A: Sum of three Waves					
Fairness	3,933	0.13	0.33	0	1
Political ideology	3,933	0.31	0.46	0	1
Experience of mobility	3,933	0.27	0.44	0	1
Unemployment	3,933	0.03	0.17	0	1
Marital status	3,933	0.69	0.46	0	1
Female	3,933	0.48	0.49	0	1
University education	3,933	0.06	0.24	0	1
Secondary education	3,933	0.22	0.62	0	1
Age	3,933	35.9	12.3	18	95
Income level	3,933	5.19	2.3	1	10
Panel B: For each					

Wave					
					Wave 3
Fairness	733	.08	.28	0	1
Political ideology	733	.29	.45	0	1
Experience of mobility	733	.32	.46	0	1
Unemployment	733	.01	.12	0	1
Marital status	733	.72	.44	0	1
Female	733	.49	.50	0	1
University education	733	.09	.29	0	1
Secondary education	733	.15	.54	0	1
Age	733	36.8	13.2	18	95
Income level	733	3.9	2.8	1	10

Wave 4					
Fairness	1,200	.31	.43	0	1
Political ideology	1,200	.22	.46	0	1
Experience of mobility	1,200	.03	.41	0	1
Unemployment	1,200	.66	.18	0	1
Marital status	1,200	.47	.47	0	1
Female	1,200	.47	.33	0	1
University education	1,200	.05	.23	0	1
Secondary education	1,200	.26	.67	0	1
Age	1,200	36.6	12.1	18	95
Income level	1,200	5.4	2.09	1	10

Wave 6					
Fairness	2,000	.13	.34	0	1
Political ideology	2,000	.33	.47	0	1
Experience of mobility	2,000	.32	.46	0	1
Unemployment	2,000	.03	.17	0	1
Marital status	2,000	.73	.44	0	1
Female	2,000	.48	.49	0	1
University education	2,000	.05	.22	0	1
Secondary education	2,000	.05	.28	0	1
Age	2,000	34.3	11.8	18	95
Income	level	5.5	2.1	1	10
2,000					

Note: This table provides descriptive statistics for the control variables of the study. Most of the variables of the study are dummies that capture the influence of major individual characteristics on preferences for government redistribution.

4   Empirical Strategy

This section presents the econometric strategy used to explore the impact of social conflict and individual's perception of income inequality on preferences for government redistribution. Previous studies[10] on social conflict and perceptions about income inequality have exploited various methods to find causal impacts of social conflict and perceptions about income inequality on preferences for redistribution. We use logit regression, to explore the impact of social conflict and income differences between rich and poor on preferences for government redistribution at individual perception level. The focused independent variables of the study are social conflict, measured by proxy of social trust and individuals' perception of income inequality. The comprehensive discussion on the identification of social conflict proxy by social trust and how a given social trust is expressed as a form of social conflict is given in section 3.1.2.1. Similarly, a detailed discussion on income differences measured by perceptions of individuals about income inequality is given in section 3.1.2.2. As discussed above, the outcome variable of the study is preferences for government redistribution based on the dummy.
Our baseline regression equation used in the empirical analysis is:

$$Y_{iw} = \beta_1\, SC_{iw} + \beta_2\, DINM_{iw} + \beta_3\, X_{iw} + \varepsilon_{iw}. \tag{1}$$

Where,

Y_{iw} represents preferences for redistribution and a dependent variable for each individual i in a given Wave w. SC_{iw} represents social conflict proxy by the social trust at each individual i in a given wave w. $DINM_{iw}$ denotes income differences between rich and poor measured by individual's

---

[10] See the following studies (Justino, 2004; Takeuchi, 2014; Yamamura, 2015).

perceptions of income inequality, which might affect the likelihood of an individual i in a given wave w to support government redistribution. X_{iw} is a set of demographic, socio-economic, and political control variables at the individual level, discussed in section 3.1.3, while ε_{iw} is an error term.

We chose to employ the logistic regression (logit) model over probit regression for several reasons. Firstly, logistic regression is widely recognized and utilized in empirical research, offering a straightforward interpretation of results in terms of odds ratios (Younas, 2023). This interpretability is particularly advantageous when communicating findings to a broad audience, as it facilitates a clear understanding of the relationship between the explanatory variables and the dependent variable, Preference for Redistribution. Additionally, logistic regression tends to be computationally efficient, especially with large datasets, which enhances the feasibility of our analysis. While probit regression is a viable alternative, logit regression's widespread use, ease of interpretation, and computational efficiency made it the preferred choice for our study (Chen & Tsurumi, 2010).

5   Results and Discussion

5.1   Baseline Results

Previously, empirical researchers have acknowledged various determinantal effects on preferences for redistribution. Contrastingly most of the preceding studies, this study attempts to identify how social conflict affects individuals' preferences for redistribution. For this purpose, we estimated equation 1 to find the impact of social conflict and perceptions about income inequality on preferences for redistribution at an individual's perception level. Table 3 reports the estimation results of the marginal effects of logit regression[11] where the first column provides raw correlations among social trust, individual perceptions about income differences, and preferences for redistribution. Likewise, each consecutive column of Table 3 gradually includes controls for the individual characteristics. This is deemed satisfactory to interpret the based outcome when testing the hypothesis proposed in the introduction. Technically, the

---

[11] See appendix A, table 7 for the odd ratios.

fall down of social trust within society has fewer preferences of individuals towards redistribution. Broadly, the results show that individuals with a lower social trust within society have a lesser individual's preference power towards redistribution. These results are statistically significant at a 5% level of significance for all the specifications and sizeable as well. In terms of magnitude, the marginal effect of social trust explains that individuals with a lower social trust have 3.2% less redistributive preferences than the respondents who have high social trust.

These results are consistent with the fact that there is an unfair distribution of resources within different groups in a society. Correspondingly, the presence of lower social trust in society has decreased the preferences of individuals towards redistribution and Individuals may possibly compel offense and unlawful deeds because of an observed deficiency of equality as well as a necessity for effective redistributive policy to develop the social trust of people within society. These results are consistent with those obtained by Stack (1984), Jordahl (2007), Samman and Melamed (2013), and Fischer and Torgler (2013).

Table 3 Baseline results on the full sample

	(1)	(2)	(3)	(4)
Social trust	.035**	.033**	.029**	.032**
	(.014)	(.014)	(.014)	(.014)
Income differences	.056***	.031**	.032**	.033**
	(.014)	(.015)	(.015)	(.015)
Observations	3,933	3,933	3,933	3,933
Pseudo R-squared	0.005	0.018	0.022	0.026
Socio-Economic controls	N	Y	Y	Y
Demographic controls	N	N	Y	Y
Political controls	N	N	N	Y

Note: The explained variable in the logit regressions is the individual's preferences for redistribution and focused independent variables are social trust proxied for social conflict and individuals' perceptions about income inequality. This table estimates the results of logit regression in terms of marginal effect. Column (1) reports the raw correlation while columns 2-4 gradually include various control variables. In all regressions, standard errors are in the parenthesis. Where**, *, **,** and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Similarly, we correspondingly study the effects of income differences on the individual's preferences for redistribution. The empirical outcomes of this relationship are reported in Table 3. Theoretically, individuals perceive a large income difference between rich and poor indicating that individuals are more tending to prefer redistribution. So the estimated sign of β_2, in this case, is positive, which means individuals perceive that a high level of income difference in their society has a high demand for redistribution. The results show an anticipated indication for all the specifications, while several are statistically significant at a 5% level of significance. In terms of magnitude, table 3 shows that individuals who have perceived that the income differences are large between rich and poor people are 3.3% more expected to support preferences for redistribution than the individuals who have perceived that income differences are not large between rich and poor. These results are consistent with those obtained by Corneo and Gruner (2000), Fischer (2009), Neher (2011), and Yamamura (2016), who also found that people's perceptions of income differences affect preferences for redistribution.

5.2   Distributional Preferences Across Each Wave

This section discusses the effects of social trust proxy for social conflict, individual's perception of income differences on preferences for redistribution across each wave. Meanwhile, there are surveys from three different years (i.e. 1995, 2004, and 2014). It is correspondingly probable to evaluate whether individuals' perceptions and preferences have changed over time. We start by empirically exploring this effect for wave 3 in

Table 4. [12] We find the positive but statistically insignificant relationship between social trust and preferences for redistribution in all specifications. However, this effect is not statistically significant for wave 3.

Table 4 Estimation results based on wave 3 sample

	(1)	(2)	(3)	(4)
Social trust	.027	.038	.035	.038
	(.038)	(.039)	(.038)	(.039)
Income differences	.082**	.000	.001	.000
	(.033)	(.033)	(.033)	(.033)
Obervations	733	733	733	733
Pseudo R-squared	0.010	0.038	0.043	0.057
Socio-Economic controls	N	Y	Y	Y
Demographic controls	N	N	Y	Y
Political controls	N	N	N	Y

Note: The explained variable in the logit regressions is the individual's preferences for redistribution and focused independent variables are social trusts proxied for social conflict and individuals' perceptions about income inequality. This table estimates the results of logit regression in terms of marginal effect. Column (1) reports the raw correlation while Columns 2-4 gradually include various control variables. In all regressions, standard errors are in the parenthesis. Where *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. Standard errors are in the parenthesis.

Similarly, we also find the impact of an individual's perception of income differences on the individual's preferences for redistribution. The expected sign of β_2 in all specifications is a positive but statistically significant association between an individual's perception of income

---

[12] See appendix A, table 8 for the odd ratios.

differences and preferences for redistribution for wave 3 in the specification (1). This result is consistent with the fact that individuals have high preferences towards redistribution when individuals perceive large income inequality. However, this outcome is not statistically significant for wave 3 subsequently controlling for socioeconomic, demographic, and political characteristics of an individual.

Table 5 Estimation results based on wave 4 sample

	(1)	(2)	(3)	(4)
Social trust	.007	.005	.005	.0003
	(.019)	(.019)	(.019)	(.019)
Income Differences	.052**	.051**	.050**	.050**
	(.020)	(.021)	(.021)	(.021)
Observations	1,200	1,200	1,200	1,200
Pseudo R-squared	0.003	0.005	0.006	0.009
Socio-Economic controls	N	Y	Y	Y
Demographic controls	N	N	Y	Y
Political controls	N	N	N	Y

Note: The explained variable in the logit regressions is the individual's preferences for redistribution and focused independent variables are social trust proxied for social conflict and individual perceptions about income inequality. This table estimates the results of logit regression in terms of marginal effect. Column (1) reports the raw correlation while columns 2-4 gradually include various control variables. In all regressions, standard errors are in the parenthesis. Where *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Correspondingly, social trust and individual perception about income difference analysis for Wave 4 is presented in Table 5. Similar results can also be noted in Table 5[13] for social trust. We find a positive but then irrelevant association between social trust and preferences for redistribution for all the specifications. However, this outcome is also not

---

[13] See appendix A, table 9 for the odd ratios.

statistically significant for wave 4. Furthermore, the results reported in Table 5 are related to estimating the impact of an individual's perception of income differences between rich and poor on the individual's preferences for redistribution. The results show an expected sign of β_2 for all specifications is positive and statistically significant at a 5% level of significance. The results of Table 5 provide a statistically significant association between an individual's perception of income differences and preferences for redistribution for wave 4 in all specifications. However, this result substantiates the baseline evidence provided in Table 3.

Furthermore, we also study the effects of social trust and individual's perception of income differences on preferences for redistribution for wave 6. The empirical results of this relationship indicate statistically significant signs are presented in Table 6. [14] As mentioned above the fall down of social trust within society has less preferences of individuals towards redistribution. In our analysis, we anticipate a positive sign of social trust which consequently means the lesser preferences for redistribution in lower trust within people in society. In Table 6, we find an affirmative association between social trust and preferences for redistribution in all specifications. This finding is analogous to the baseline results presented in Table 3.

Table 6 Estimation results based on wave 6 sample

	(1)	(2)	(3)	(4)
Social trust	.067**	.044*	.015*	.022*
	(.027)	(.026)	(.024)	(.024)
Income Differences	.282***	.256***	.230***	.234***
	(.034)	(.035)	(.035)	(.033)
Observations	2,000	2,000	2,000	2,000
Pseudo R-squared	0.049	0.094	0.153	0.170
Socio-Economic controls	N	Y	Y	Y
Demographic controls	N	N	Y	Y

---

[14] See appendix A, table 10 for the odd ratios.

Political controls	N	N	N	Y

Note: The explained variable in the logit regressions is the individual's preferences for redistribution and focused independent variables are social trust proxied for social conflict and individual perceptions about income inequality. This table estimates the results of logit regression in terms of marginal effect. Column (1) reports the raw correlation while columns 2-4 gradually include various control variables. In all regressions, standard errors are in the parenthesis. Where *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Moreover, the results of Table 6 offer a positive impact of an individual's perception of income difference on preferences for redistribution for wave 6 in all specifications. This finding is statistically significant at a 1% significance level. The results of each wave are consistent with the fact that individual perceptions and preferences have changed over time. Analogously, these results show considerable shifts in the distribution of individuals' perceptions of inequality over time. Specifically, individuals' perceptions have explicitly increased over time about inequality, and this increasing change in individual inequality perceptions equals the development of the actual level of inequality in most countries. This is a fascinating consequence, signifying that the rise in the actual level of inequality was a corresponding shift toward growing tolerance of inequality in society. As a result, there is essentially much change in the redistributive preferences over time.

Our findings highlight the tricky dynamics of socio-economic attitudes within Pakistan and stress a powerful connection between social conflict and the tendency towards redistribution. With Pakistan struggling with the constant challenges of income inequality and social unrest, the outcomes emphasize the nuanced interaction between these factors and public responses involving wealth distribution. As people navigate the complications of societal tensions, their changing observations towards redistribution display a deep-seated appeal for fair allocation of resources. Additionally, this research shows the impact of observations around income disparities, illustrating how heightened knowledge of such inequalities feeds support for redistributive measures. These intuitions provide policymakers with constructive understandings into making more open and comprehensive socio-economic policies that address the primary

drivers of social conflict while fostering a wisdom of fairness and harmony within Pakistani society.

6. Conclusion

Generally, the presence and persistence of conflict and income differences among individuals in democratic countries have elevated numerous questions on the effectiveness of the democratic system. Recent political economy literature finds facts that social conflict and income inequality adversely affect the economic and social development of a country. This study broadly deals with social conflict and individual perceptions about income differences in Pakistan and their impact on preferences for redistribution.

To empirically estimate how the degree of social conflict and perceptions of individuals about income differences relate to individual preferences for redistribution. We have exploited data on preferences for redistribution from the World Value Survey (WVS) conducted at an individual level in Pakistan in three waves, together with information on the proxy of social conflict and individual perceptions of income differences between rich and poor.

The logit regression method is employed to analyze the impact of social conflict and individual perceptions of income differences between rich and poor on individual preferences for redistribution. Our results show that social conflict positively affects preferences for redistribution. In other words, less degree of social conflict inside society has low demand for redistribution. Similarly, we have also found a positive impact of individuals' perceptions about income differences between rich and poor on preferences for redistribution, which means that individuals who perceive large income differences between rich and poor have more preferences towards redistribution. Furthermore, the results of our study suggested that individual's perceptions and preferences for redistribution have changed over time.

6.1 Limitations and Future Directions

While our study sheds light on the relationship between Preference for Redistribution and its determinants, namely Social Conflict and Income Differences, it is not without limitations. Firstly, our analysis

focuses solely on data from Pakistan, which may limit the generalizability of our findings to other contexts. Additionally, our study utilizes cross-sectional data, which restricts our ability to establish causal relationships between variables. Future research could benefit from longitudinal data analysis to explore the dynamics of Preference for Redistribution over time. Furthermore, while our study examines Social Conflict and Income Differences as explanatory variables, there may be other factors at play, such as political institutions, cultural norms, and historical contexts, which could also influence Preference for Redistribution. Future studies could employ a more comprehensive approach by incorporating these additional variables. Moreover, qualitative research methods, such as interviews and focus groups, could provide valuable insights into the underlying mechanisms driving individuals' preferences for redistribution in Pakistan. Overall, addressing these limitations and pursuing further research avenues will contribute to a deeper understanding of the determinants of Preference for Redistribution and its implications for policymaking and societal well-being.

References

Acemoglu, D. and Robinson, J. A. (2013). *Why nations fail: The origins of power, prosperity, and poverty*. Crown Business.

Acemoglu, D., and Robinson, J. A. (2000). Why did the West extend the franchise? Democracy, inequality, and growth in historical perspective. *Quarterly Journal of Economics,* 115(4): 1167–1200.

Acemoglu, D., and Robinson, J. A. (2001). A theory of political transition. *American Economic Review,* 91(4): 938–63.

Acheampong, A. O., Dzator, J., Abunyewah, M., Erdiaw-Kwasie, M. O., & Opoku, E. E. O. (2023). Sub-Saharan Africa's tragedy: Resource curse, democracy and income inequality. Social Indicators Research, 168(1), 471-509.

Adachi, T., and Nakamura, Y. (2008). A theory of civil conflict and democracy in unequal societies. *Economics Bulletin,* 8(2): 1–11.

Alesina, A., and Angeletos, G. M. (2005). Fairness and Redistribution. *American Economic Review*, 95(4): 960-980.

Alesina, A., and Ferrara, E. L. (2005). Preferences for redistribution in the land of opportunities. *Journal of Public Economics,* 89(5): 897–931.

Alesina, A., and Giuliano, P. (2009). Preferences for redistribution. Working Paper 14825. Cambridge, MA, NBER. *National Bureau of Economic Research*, Inc.

Alesina, A., and Perotti, R. (1996). Income distribution, political instability, and investment. European Economic Review, 40(6): 1203-1228.

Alesina, A., and Schundeln, F. N. (2007). Goodbye Lenin (or not?): The effect of communism on people's preferences. *American Economic Review*, 97(4): 1507-1528.

Alesina, A., Devleeschauwer, A., Easterly, W., Kurlat, S., and Wacziarg, R. (2003). Fractionalization. *Journal of Economic Growth*, 8(2): 155-194.

Alesina, A., Glaeser, E., & Glaeser, E. L. (2004). Fighting poverty in the US and Europe: A world of difference. Oxford University Press.

Alesina, A., Glaeser, E., and Sacerdote, B. (2001). Why doesn't the United States have a European style welfare state? *Brookings Papers on Economic Activity,* 2: 187–254.

Arrow, K. (1963). Social Choice and Individual Values. Wiley, New York.

Balcells, L., Fernández-Albertos, J., & Kuo, A. (2015). Preferences for inter-regional redistribution. *Comparative Political Studies*, 48(10), 1318-1351.

Barron, J. M., Taylor, B. A., & Umbeck, J. R. (2004). Number of sellers, average prices, and price dispersion. *International Journal of Industrial Organization*, 22(8-9), 1041-1066.

Benabou, R., & Ok, E. A. (2001). Social mobility and the demand for redistribution: the POUM hypothesis. *The Quarterly Journal of Economics*, 116(2), 447-487.

Bénabou, R., & Tirole, J. (2006). Incentives and prosocial behavior. *American economic review*, 96(5), 1652-1678.

Bloedel, A. W. (2014). Faith in the Future and Social Conflict: Economic Growth as a Mechanism for Political Stabilization (Doctoral dissertation, Duke University Durham).

Boix, C. (2003). Democracy and redistribution. Cambridge University Press.

Boswell, T., & Dixon, W. J. (1990). Dependency and rebellion: A cross-national analysis. *American Sociological Review*, 540-559.

Cashin, P. (1995). Government spending, taxes, and economic growth. *Staff Papers*, 42(2), 237-269.

Castellares, R., & Fouché, M. (2017). The Determinants of Social Conflicts in Mining Production Areas (No. 2017-100).

Chen, G., & Tsurumi, H. (2010). Probit and logit model selection. Communications in Statistics—Theory and Methods, 40(1), 159-175.

Cohn, A., Jessen, L. J., Klašnja, M., & Smeets, P. (2023). Wealthy Americans and redistribution: The role of fairness preferences. Journal of Public Economics, 225, 104977.

Collier, P., & Hoeffler, A. (2000). Greed and grievance in civil war. *Available at SSRN 630727*.

Corneo, G., & Gruner, H. P. (2000). Social limits to redistribution. *American Economic Review*, 90(5), 1491-1507.

Corneo, G., and Gruner, H. P. (2002). Individual preferences for political redistribution. *Journal of Public Economics*, 83(1): 83-107.

Cruces, G., Perez-Truglia, R., & Tetaz, M. (2013). Biased perceptions of income distribution and preferences for redistribution: Evidence from a survey experiment. *Journal of Public Economics*, 98, 100-112.

Duell, D. (2015). Social Heterogeneity and its Ambiguous Effect on Preferences for Redistribution. Unpublished paper.

Edwards, L. (2016). Homogeneity and inequality: School discipline inequality and the role of racial composition. *Social Forces*, *95*(1), 55-76.

Edwards, J. R. (2012). Compulsory Income Redistribution and Social Conflict. Management, 1(8), 49-55.

Esping-Andersen, G. (1999). *The sustainability of welfare states into the 21st century*. Barcelona, Spain: Fundació Rafael Campalans.

Etchebehere, F. G. (2018). Preferences for redistribution and biased perceptions in Uruguay: Evidence of different patterns among income groups: working paper.

Fearon, J. D., & Laitin, D. D. (2003). Ethnicity, insurgency, and civil war. *American Political Science Review*, *97*(1), 75-90.

Fischer, J. A., & Torgler, B. (2013). Do positional concerns destroy social capital: evidence from 26 countries. *Economic Inquiry*, *51*(2), 1542-1565.

Gärtner, M., Mollerstrom, J., & Seim, D. (2017). Individual risk preferences and the demand for redistribution. *Journal of Public Economics*, *153*, 49-55.

Gassmann, F., & Timár, E. (2024). Perceived position on the social ladder and redistributive preferences–A survey experiment from the Kyrgyz Republic. European Journal of Political Economy, 81, 102496.

Giuliano, P., & Alesina, A. (2007). The power of the family. National Bureau of Economic Research.

Giuliano, P., & Spilimbergo, A. (2008). Growing up in bad times: Macroeconomic Volatility and the Formation of Beliefs. UCLA mimeo.

Goto, H. (2016). Economic Development and Preferences for Redistribution (No. EMS_2016_10).

Haggard, S. M., Kaufman, R., & Long, J. D. (2010). Inequality and preferences for redistribution in the developing world. In *APSA 2010 Annual Meeting Paper*.

Haslam, P. A., & Tanimoune, N. A. (2016). The determinants of social conflict in the Latin American mining sector: new evidence with quantitative data. *World Development*, *78*, 401-419.

Hess, M. (2004). 'Spatial'relationships? Towards a reconceptualization of embeddedness. *Progress in human geography*, *28*(2), 165-186.

Hussain, I., Reddy, Y., & Kamil, M. S. (2018). Governing the ungovernable.

Jan, N., & Rizwan, M. (2023). Politics, Economic Growth & Envi An unexplored Nexus of Political Freedom, Economic Growth, Economic conditions and CO2 emission in Asian Country. The Asian Bulletin of Contemporary Issues in Economics and Finance, 3(1), 1-14.

Jordahl, H. (2009). Inequality and trust. *Published as" Economic inequality" in Svendsen, GT and Svendsen, GLH (eds.), Handbook of Social Capital, Edward Elgar*.

Justino, P. (2004). Redistribution, inequality, and political conflict. *Poverty Research Unit, Sussex, PRUS Working Paper*, (18).

Justino, P., & Verwimp, P. (2013). Poverty dynamics, violent conflict, and convergence in Rwanda. *Review of Income and Wealth*, *59*(1), 66-90.

Kelly, J. B. (2000). Children's adjustment in conflicted marriage and divorce: A decade review of research. *Journal of the American Academy of Child & Adolescent Psychiatry*, *39*(8), 963-973.

Kennedy, B. P., Kawachi, I., Glass, R., & Prothrow-Stith, D. (1998). Income distribution, socioeconomic status, and self-rated health in the United States: multilevel analysis. *Bmj*, *317*(7163), 917-921.

Klor, E. F., & Shayo, M. (2010). Social identity and preferences over redistribution. Journal of Public Economics, 94(3-4), 269-278.

Knack, S., & Keefer, P. (1995). Institutions and economic performance: cross-country tests using alternative institutional measures. *Economics & Politics*, *7*(3), 207-227.

Kuziemko, I., Norton, M. I., Saez, E., & Stantcheva, S. (2015). How elastic are preferences for redistribution? Evidence from randomized survey experiments. *American Economic Review*, *105*(4), 1478-1508.

Laursen, F., & Vanhoonacker, S. (Eds.). (2023). The intergovernmental conference on political union: institutional reforms, new policies and international identity of the European Community. BRILL.

Lierse, H., Lascombes, D. K., & Becker, B. (2022). Caught in the middle! Wealth inequality and conflict over redistribution. Social Justice Research, 35(4), 436-461.

Mahmood, R., & Idrees, M. (2010). Income polarization in Pakistan: Measurement and decomposition. *Pakistan Economic and Social Review*, 225-244.

Majeed, G. (2010). Ethnicity and ethnic conflict in Pakistan. *Journal of Political Studies*, *17*(2), 51.

Malik, K. (2014). Human development report 2014: Sustaining human progress: Reducing vulnerabilities and building resilience. *United Nations Development Programme*, New York.

Masson, P. R. (1996). Fiscal dimensions of EMU. *The Economic Journal*, *106*(437), 996-1004.

Melamed, C., & Samman, E. (2013). *Equity*, inequality, and human development in a post-2015 framework. UNDP, Human Development Report Office.

Meltzer, A. H., and Richard, S.F. (1981). A rational theory of the size of government. *Journal of Political Economy,* 89(5): 914–27.

Midlarsky, M. I. (1988). Rulers and the ruled: Patterned inequality and the onset of mass political violence. *American Political Science Review*, *82*(2), 491-509.

Nastain, N., Abdullah, I., Qodir, Z., & Jubba, H. (2024). Trends and Model of Oligarchy Politics in the World. Available at SSRN 4783783.

Neher, F. (2011). Preferences for redistribution across the world. *School of Business & Economics Discussion Paper: Economics*, (2012/2).

North, D. C., John J. W., and Barry R. W. (2009). Violence and social orders: a conceptual framework for interpreting recorded human history. London, Cambridge University Press.

Osberg, L., & Smeeding, T. (2006). Fair inequality? Attitudes toward pay differentials: the United States in comparative perspective. *American Sociological Review*, *71*(3), 450-473.

Piketty, T. (1995). Social mobility and redistributive politics. *The Quarterly journal of economics*, *110*(3), 551-584.

Rainer, H., & Siedler, T. (2008). Subjective income and employment expectations and preferences for redistribution. *Economics Letters*, *99*(3), 449-453.

Roberts, K. W. (1977). Voting over income tax schedules. *Journal of Public Economics*, *8*(3), 329-340.

Rodrik, D. (1999). Where did all the growth go? External shocks, social conflict, and growth collapse. *Journal of economic growth*, *4*(4), 385-412.

Romer, T. (1975). Individual welfare, majority voting, and the properties of a linear income tax. *Journal of Public Economics*, *4*(2), 163-185.

Schokkaert, E., & Truyts, T. (2017). Preferences for redistribution and social structure. Social Choice and Welfare, 49, 545-576.

Stewart, F., & Fitzgerald, E. V. (2001). *War and underdevelopment*. Oxford University Press.

Takeuchi, S. (2014). Introduction: Land and property problems in peacebuilding. In *Confronting land and property problems for peace* (pp: 1-28).

Thorbecke, E., & Charumilind, C. (2002). Economic inequality and its socioeconomic impact. *World Development*, *30*(9), 1477-1495.

Todd, E. (1985). The explanation of ideology: Family structures and social systems. Oxford [Oxfordshire]; New York, NY, USA: B. Blackwell.

Tucker, S., & Xu, Y. (2023). Fairness,(perception of) inequality, and redistribution preferences. Journal of Economic Surveys, 37(5), 1529-1533.

Voors, M. J., Nillesen, E. E., Verwimp, P., Bulte, E. H., Lensink, R., & Van Soest, D. P. (2012). Violent conflict and behavior: a field experiment in Burundi. *American Economic Review*, *102*(2), 941-64.

Waseem, M. (2011). Patterns of conflict in Pakistan: Implications for policy (pp: 8-11). Washington, DC: Brookings Institution.

Yamamura, E. (2012). Social capital, household income, and preferences for income redistribution. *European Journal of Political Economy*, *28*(4), 498-511.

Yamamura, E. (2016). Social conflict and redistributive preferences among rich and poor: testing the hypothesis of Acemoglu and Robinson. *Journal of Applied Economics,* 19(1): 41-64.

Younas, M. Z. (2023). Regional institutional quality and firm-level innovation: A case of selected South Asian economies. Quality & Quantity, 57(1), 615-643.

Appendices

Appendix A: Odd Ratios of Logit Regression

Table 7 Odd ratios of table 3

	(1)	(2)	(3)	(4)
Social trust	-0.196*	-0.185*	-0.167*	-0.183*
	(-2.50)	(-2.34)	(-2.09)	(-2.27)
Income Differences	0.309***	0.176*	0.181*	0.186*
	(3.92)	(2.10)	(2.15)	(2.20)
Observations	3933	3933	3933	3933
Pseudo R2	.005	.018	.022	.026
Socio-Economic Controls	N	Y	Y	Y
Demographic Controls	N	N	Y	Y
Political Controls	N	N	N	Y

Table 8 Odd ratios of table 5

	(1)	**(2)**	**(3)**	**(4)**
Social trust	-0.171	-0.242	-0.231	-
	(-0.75)	(-1.04)	(-1.98)	0.350*
				(-2.94)
Income Differences	0.113	0.137	0.126	0.496*
	(0.63)	(0.65)	(0.60)	(2.59)
Observations	733	733	733	733
Pseudo R2	.038	.058	.061	.093
Socio-Economic Controls	N	Y	Y	Y
Demographic Controls	N	N	Y	Y
Political Controls	N	N	N	Y

Table 9 Odd ratios of table 5

	(1)	**(2)**	**(3)**	**(4)**
Social trust	-0.041	-0.027	-0.035	0.000
	(-0.39)	(-0.26)	(-0.33)	(0.00)
Diff. Income	0.277*	0.260*	0.258*	0.258*
	(2.56)	(2.38)	(2.37)	(2.36)

Observations	1,200	1,200	1,200	1,200
Pseudo R2	0.038	0.058	0.061	0.093
Socio-Economic Controls	N	Y	Y	Y
Demographic Controls	N	N	Y	Y
Political Controls	N	N	N	Y

Table 10 Odd ratios of table 6

	(1)	(2)	(3)	(4)
Social trust	-0.334*	-0.223*	-0.539*	-0.513*
	(-2.20)	(-2.42)	(-2.63)	(-2.60)
Diff. Income	0.366*	0.374*	0.431*	0.452*
	(2.48)	(2.49)	(2.79)	(2.89)
Observations	2,000	2,000	2,000	2,000
Pseudo R2	.049	.094	.153	.170
Socio-Economic Controls	N	Y	Y	Y
Demographic Controls	N	N	Y	Y
Political Controls	N	N	N	Y