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Impact of COVID-19 Lockdown Policy on Employment & Income in Pakistan

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Review of literature

1. Impact of COVID-19 on Employment

COVID-19 pandemic is a global crisis. Most of the countries implement various policies like lockdown, large scale testing with isolation and also voluntary social distancing to slow down the outbreak of pandemic. In terms of the priority assigned to the three strategies, a country varies significantly (Singh, Singh, & Baruah, 2020). Lockdown policy is common which is implemented globally in order to restrict the movement of people to slow the spread of COVID-19. Although lockdown policy might be helpful for saving lives but it has adverse economic and socioeconomic consequences (Han et al. 2020). Economic activity has been seriously depressed by the COVID-19 pandemic worldwide particularly less developed or poor countries having weak health care system are facing more challenges (De Guzman, & Malik, 2020). Industries and businesses are facing the challenge of their survival many of them have cut down their labour force and few are closed down during this time period of COVID-19 (Pappas, 2020). According to the ILO the current pandemic crisis is more severe than the 1930s Great depression and also global financial crisis 2009 in the context of unemployment. The recent stats by ILO shows that about 255 million people lost their full time employment and the percentage of loss of global working hours were remained 8.8% in 2020.

A significant impact of this pandemic on unemployment is observed across the population particularly poor segments worldwide. During the months of March to April 2020, United State observed a drastic increase in the percentage of unemployment i.e. from 4.4 % to 14.7%. Similarly, for the case of Australia this percentage increases from 5.4% to 11.7% (Suomi, Schofield, & Butterworth, 2020). Similarly, same is the case for UK as nearly eight million people loss their job during the current COVID-19 pandemic and associated treatment policies to control the outbreak of pandemic (Chapman et al. 2020).

Beland et al. (2020) investigate the impact of covid-19 on employment and wages in short run. Their results shows that covid-19 adversely affect the unemployment rate, labour force participation and working hours but no significant impact of covid-19 on wages has been observe. In addition, the workforce that severely affected by current pandemic are mostly belongs to poor class like women, self-employed and temporary and low wage workers, and also the workers having less educational background [(Pouliakas & Branka 2020) and (Fana et al. 2020)]. Quality of life is declining day by day due to the rise in the unemployment as many countries are facing the situation of lockdown in order to control the outbreak of COVID-19. For the case of Germany, (Bauer & Weber, 2020) finds that 60% rise in the unemployment during the month of April 2020 was due to the lockdown measures taken by the government to control the spread of current pandemic. Likely, Adams-Prassl et al. (2020) examine the impact of COVID-19 on the employment and job loss in US, UK and Germany. They observe that the impact of current pandemic on labour market is not similar across different countries but overall these countries experienced an increase in the unemployment rate. According to the results 18% of the individuals in US, 15% of the individuals in UK while 5% individual in Germany lost their jobs during the first wave of the pandemic and most of

the individuals who lost their jobs were self-employed, those who can't manage to do work from home and don't have any college degree. Adding in it, Lemieux et al. (2020) investigate the impact of COVID-19 outbreak on labour market of Canada. Their outcome shows that the employment caused due to COVID-19 pandemic is 15%. Moreover the most vulnerable groups among them are younger workers, paid hourly etc.

It has been noted that almost all countries have lost a large share of their GDP since the first wave of the pandemic, and unemployment has become the greatest problem. Further, COVID-19 crisis and the associated lockdown policy affected more severely the people in developing countries (Ray & Subramanian, 2020). Singh, Singh, & Baruah, 2020 found an increase in the unemployment rate to 25% and about 83% household experienced income loss in India. Pakistan is not the exception in that situation as lockdown policy to control the spread of COVID-19 resulted in the significant decline in employment and income across Pakistan. According to the estimated stats, recent pandemic crises would leave approximately 25 million workforce unemployed and the current lockdown situation increase unemployment ratio rapidly (Javed, 2020). The current report published by Pakistan Bureau of Statistic shows that percentage of the working population before COVID-19 was about 35% (55.74 million), however due to lockdown and closure of economic activities this percentage decreases to 22% (35.04 million). After lockdown is over, the recovery process is observed during the month of July 2020 and the percentage of working population reached at 33% (52.56 million) from 22%.

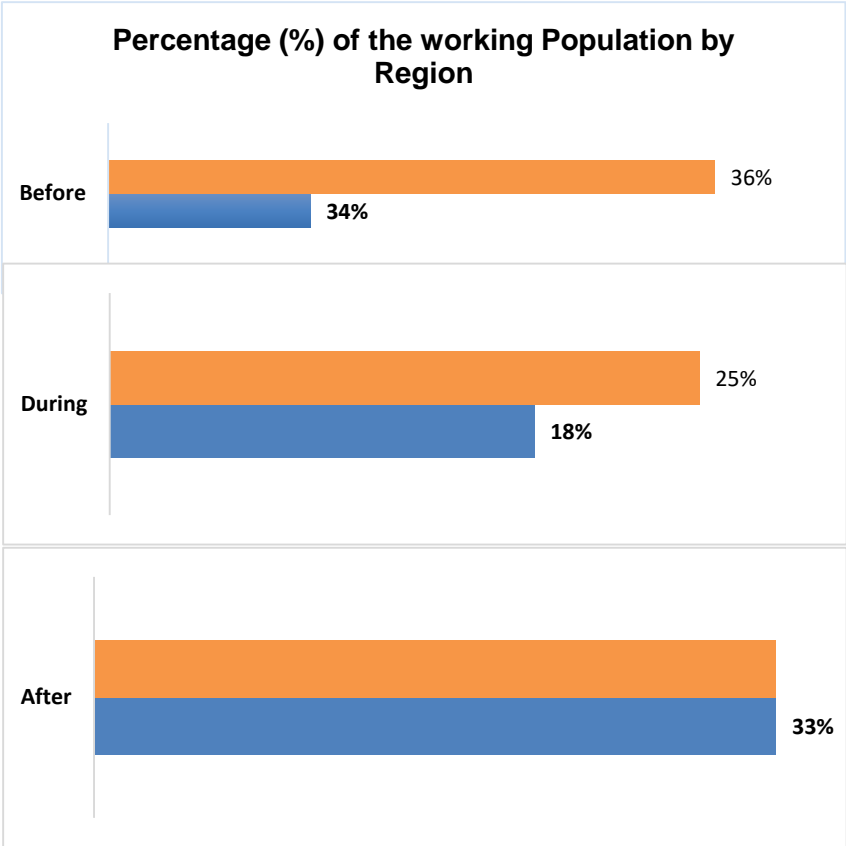**Table I: Impact of COVID-19 on Working Population (Province Wise)**

	Before	During	After
Pakistan	35	22	33
Punjab	36	22	34
Sindh	38	23	33
Khyber Pakhtunkhwa	29	21	28
Balochistan	33	24	35

Source: PBS, Government of Pakistan

Table 1 shows that the most affected province due to COVID-19 pandemic population is Sindh whose working population drastically decline from 38% to 23% during COVID-19 period i.e. from (April to July, 2020). Punjab is the second most affected province after Sindh as the working population decreases from 36% to 22% during the period of COVID-19. Working population of Balochistan and Khyber Pakhtunkhwa declines from 33% to 24% and form 29% to 21% respectively.

It is noted from various studies that urban regions experienced more employment loss than that of rural regions (Deshpande, 2020). Michael, Amparo and Contreras-González (2020) examine the impact of COVID-19 outbreak in Sub Saharan African countries (Uganda, Ethiopia, Nigeria, and Malawi) using phone survey. They observed that in all these four countries urban area employment is more affected as compare to rural areas. In Uganda the pattern of job loss in context of urban vs. rural areas was (29% &11%), in Ethiopia this pattern was (12% & 6%), and in Nigeria this pattern was (56% & 40%) following this the

pattern in Malawi was (8% and 6%) respectively. For the case of India (Satyaki,2020) observed the same results that urban unemployment is more significant than rural due to current health crisis. He argues that, 8 out of 10 workers from urban region and 6 out of 10 workers from rural region experienced the job loss during this COVID-19 pandemic and lock down policy. Similarly, the extent of job losses in Pakistan is more prominent in urban areas than in most rural areas of the country due to the lockdown.

Percentage (%) of the working Population by Region

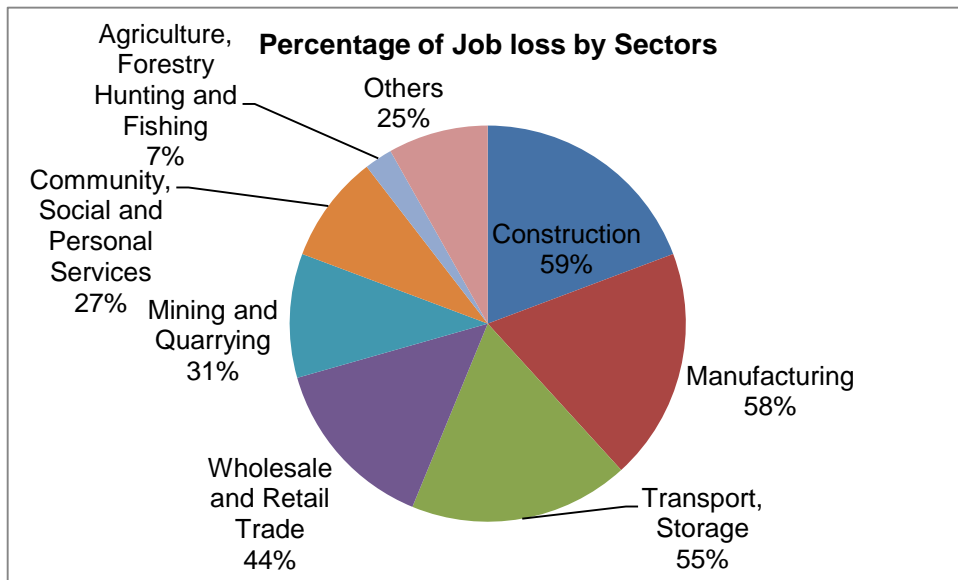|	
Before	36% (orange), 34% (blue)
During	25% (orange), 18% (blue)
After	33% (blue)

Source: PBS, Government of Pakistan.

Above chart shows that the out of 34%, 18% of the urban population is affected during the COVID-19 period and 25% out of 36% population of rural region are affected during the COVID-19 respectively. This percentage shows that the urban region is more affected during the current pandemic period as compare to rural region. However the percentage of recovery remains the same at 33%.
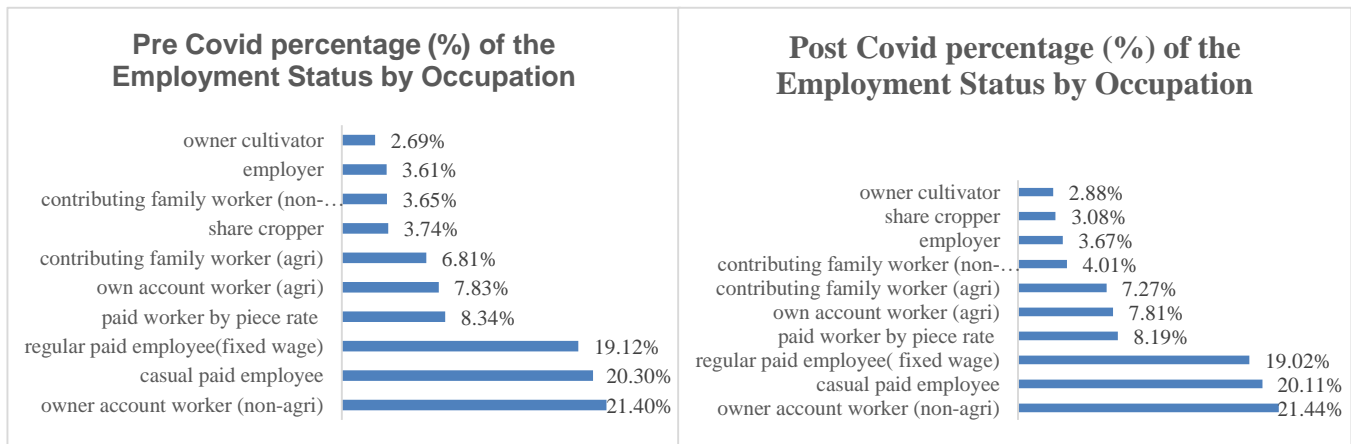
The Percentage of employment or job loss because of COVID-19 pandemic and resulting lockdown policies varies across the different sectors and occupations. Studies shows that the most vulnerable working groups or the working population belongs to low productivity sectors are the most affected one due to the current pandemic crisis (Fana et al. 2020). Barrot et al. (2020) while analysing the impact of COVID-19 on employment in France, finds that agriculture, services, wholesale and retail, Food, and construction are the most affected

sectors facing the drastic decrease in their workforce because of COVID-19 whereas the decreases in the employment was less in computer services, scientific and other technical activities. Likely, according to the Del Rio-Chanona et al. (2020), In case of US Tourism, Entertainment, and Restaurants are the most affected sectors that faces more demand and supply shocks that in turn adversely impact the vulnerable working groups. In Pakistan, approximately half of the work force is adversely affected because of the COVID-19 crisis that leads to closure of economic activities.

Percentage of Job loss by Sectors

- Agriculture, Forestry Hunting and Fishing 7%
- Others 25%
- Community, Social and Personal Services 27%
- Mining and Quarrying 31%
- Construction 59%
- Manufacturing 58%
- Wholesale and Retail Trade 44%
- Transport, Storage 55%

Source: PBS, Government of Pakistan

The above chart shows that construction is the sector whose working force is affected the most during the COVID-19 period and the percentage of the job loss in this sector is 59%. Manufacturing sector is the second most affected sector in term and the percentage of job loss is 58%. Job loss in transport sector is also significant and its percentage is 55%. Moreover, out of this large number is of vulnerable working group or informal sectors like daily wagers, shop keepers, taxi drivers etc.

Pre Covid percentage (%) of the Employment Status by Occupation

- owner cultivator 2.69%
- employer 3.61%
- contributing family worker (non-... 3.65%
- share cropper 3.74%
- contributing family worker (agri) 6.81%
- own account worker (agri) 7.83%
- paid worker by piece rate 8.34%
- regular paid employee(fixed wage) 19.12%
- casual paid employee 20.30%
- owner account worker (non-agri) 21.40%

Post Covid percentage (%) of the Employment Status by Occupation

- owner cultivator 2.88%
- share cropper 3.08%
- employer 3.67%
- contributing family worker (non-... 4.01%
- contributing family worker (agri) 7.27%
- own account worker (agri) 7.81%
- paid worker by piece rate 8.19%
- regular paid employee(fixed wage) 19.02%
- casual paid employee 20.11%
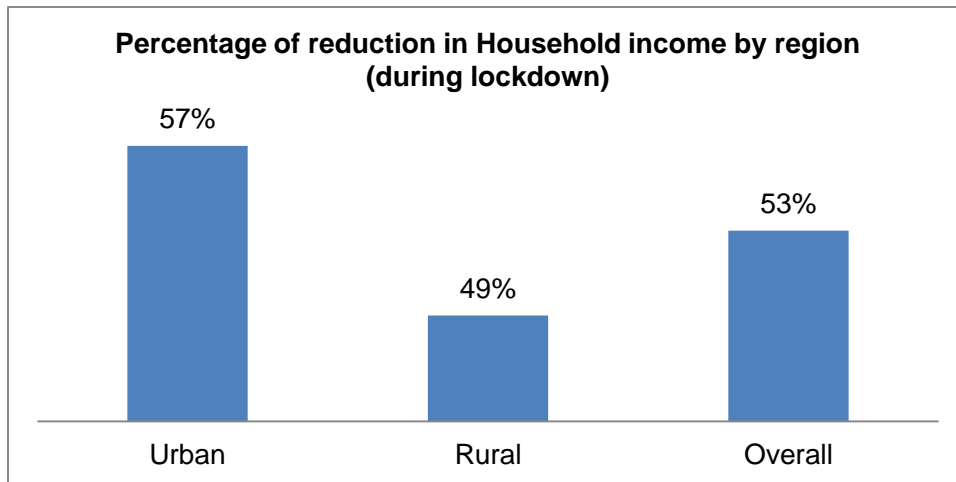- owner account worker (non-agri) 21.44%

Above chart show that almost 74% of the working population that belongs to informal sectors is affected during the COVID-19 period i.e. the percentage of job loss during first wave of pandemic is of Own Account worker (non-agriculture), casual paid employee, and paid worker by piece rate is 30%, 29% and 15% respectively.

2. Impact of COVID-19 on Income

COVID-19 pandemic has significant impact on the households in different ways. The effect of this pandemic on household incomes is mainly functioning through the labour market. Due to the economic recession caused by COVID-19 results in the loss of employment income. A survey study shows that during the first wave of the pandemic i.e. the time period from March to October 2020, about half of the US households faced decline in their employment income. Similarly, Acs, & Karpman, (2020) observed that about 40% of the US adult lost their jobs or income because of the current pandemic and they mostly belongs to lower income families. In addition, service sector like hospitality, travel or non-essential retail services etc. are sectors whose work force faced the unemployment or decline of employment income during current crisis of pandemic. Similarly, according to Soehardi, Untari, & Raya, (2020) because of the COVID-19, approximately 1226 hotels have been temporarily closed in Indonesia and estimated stats shows that it affects about 150,000 employees in term of income loss. Kansiime et al. (2020), examine the impact of COVID-19 on income of household in Kenya and Uganda using the online survey data from 442 respondents. They find that out of these respondents more than half of them face decline in their income due to current pandemic. Further, they also concluded that as farmers depend on market and due to lock down and other restrictions, they are more affected as compare to salaried workers in term of income loss.

Most of the developing countries, beside the loss in employment income on average approximately 60% household had to face the decline in their other key sources of income like remittance (both local and international) because of the job losses or unemployment (Sánchez-Páramo, & Ambar,2020). Pakistan's economy is also severely affected due to the closure of economic activities, decrease in imports and exports, Foreign Direct Investment and remittances that will lead to further increase in unemployment and poverty. Asian Development Bank conduct the study to investigate impact of COVID-19 on the farm household in Punjab, Pakistan based on the computer-assisted telephone survey of 668 farmers across 10 districts of Punjab Province. The result shows that due to the COVID-19 nearly 33% of households experienced losses in their wages and nonfarm earnings because of COVID-19, while 22% household experience the return of at least one family member from urban or other areas due to job loss which in turn reduced their cash income. Similarly, according to the recent report issued by Pakistan Bureau of Statistics, almost 53 percent of the households faced income loss during the COVID-19 period (April-July).

Percentage of reduction in Household income by region (during lockdown)

Source: PBS, Government of Pakistan

According to above chart more urban household faced a reduction in their income as compared to rural household during COVID-19 period. The percentage of urban household reported reduction in income is 57% while of rural household is 49%.

Problem Statement

The economic consequences of current pandemic and resulting lockdown policies have more impact on the members of the society, so it is essential to examine the impact of COVID-19 outbreak and resulting policies of government at individual level. Most of the studies examine the effect of COVID-19 pandemic at the aggregate level like poverty, government expenditures, GDP growth, Employment etc. (ILO, 2020 and World Bank, 2020) but very few studies are available on the impact of current pandemic and related lockdown policies at the individual level to design appropriate policies accordingly that target the most vulnerable individuals due to current crisis. The present study contributes in the existing literature by empirically investigating the COVID-19 and associated treatment policy (lockdown) impact on the employment of the individuals.

Research Hypothesis

With regard to the current COVID-19 crisis, the hypothesis of our study are:

1) H_0: There is no significant impact of COVID-19 lock down policy on the employment status at individual level.

H_1: There is a significant impact of COVID-19 lock down policy on the employment status at individual level.

2) H_0: There is no significant impact of COVID-19 lock down policy on the income at individual level.

H_1: There is a significant impact of COVID-19 lock down policy on the income at individual level.

Data and Methodology

In this section we will discuss in detail the data and methodology used in present study to measure the impact of lock down policy on the employment and income status of the individuals.

Data and Variables

The data used in our analysis are taken from the special survey conducted in order to evaluate the Socio-Economic impact of COVID-19 pandemic on the living standard of the households by Pakistan Bureau of Statistics (PBS). Pakistan Bureau of Statistics is considered as the main government agency whose responsibility is to provide official statistics for Pakistan.

We take data on household employment status, income, age, gender and region. We collects information regarding working population and income from work, Pre Covid-19(January-March 2020) and Post Covid-19 (August-October 2020).

Methodology

Pre-Post analysis is extensively used in the field of research. The main purpose of this analysis is to make comparison among the groups or to measure the change after implementation of some treatment policy. Moreover, the measurement of change provide the information regarding the impact of certain policy or intervention on the targeted group (Dimitrov, & Rumrill, 2003).

Analysis of variance (ANOVA) on gain score and on residual scores, Analysis of covariance (ANCOVA), and Repeated measures ANOVA are some statistical methods used in pre-post analysis. Further, in the field of education, medical and psychology, effect size measure is widely used to estimate and compare the change experienced by certain group after some intervention. Literature shows that these methods (ANOVA, ANCOVA) may lead to biased results as they does not taken in to account the probability that the change that occurs in the treatment group is specifically due to some intervention or it is due to the other factors like difference in the characteristics of the treatment and control group (Setiawan, & Kudus,2020).

Some criteria are essential in pre-post analysis to estimate the major or minor change. Distributional based methods helps to estimate the small change or difference which sampling random fluctuation and measurement error fails to do (Jacobson and Truax, 1991; Crosby et al., 2003; Bauer et al., 2004 and Estrada, Ferrer, & Pardo, 2019). These changes are often named as statistically reliable or reliable change and minimally detectable change as well (Maassen, 2000; Beaton et al., 2001; de Vet et al., 2006). Average-based change approach (ABC) and the Individual-based change approach (IBC) are two techniques used to identify or estimate these reliable changes. Average-based change approach (ABC) helps to detect the resulting difference or change experienced by whole group after some intervention while Individual-based change approach (IBC) aims to detect resulting difference or change experienced by the each individual in the group (Estrada, Ferrer, & Pardo, 2019). In order to measure the ABC certain statistic are used by the researchers like

centre of the distributions (i.e. Pre-Post means), null hypothesis test and effect size (Lachenbruch and Cohen, 1989; Fritz et al., 2012; Grissom and Kim, 2012; Pek and Flora, 2018) while to measure IBC certain indices based upon pre-post differences, standard error of measurement, and on linear regression predictions are used (Crosby et al., 2003; Ferrer and Pardo, 2014).In the present paper we use these two approaches i.e. ABC and IBC approach to estimate the impact of resulting lockdown policy due to COVID-19 pandemic on income status of individual. Further, as the data in our study is of binary or categorical in nature so we use visual analysis to measure the variation in the employment status of the individual in pre and post lock down period.

We analyse data for two time period in which the same variable is measured for two time periods i.e. Pre lockdown and Post lockdown policy for all the individual in a group. In our analysis we consider single group pre-post research design and generate data for treatment group only. Moreover, it is evident from the literature that single group research design is more commonly used in applied context and also the single treated group helps to develop indices that describes the percentage of change at individual level (Payne and Jones, 1957; Jacobson and Truax, 1991; Crawford et al., 1998; Hageman and Arrindell, 1999; Wyrwich et al., 1999 and Estrada, Ferrer, & Pardo, 2019).

Detecting patterns and trends in employment status of individuals

Data visualization tools are widely used nowadays (Aung, Niyeha, & Heidkamp, 2019). It helps to gain information easily when the data set is large and complex. Moreover, an effective data visualization can be helpful to support analysis and decision-making (Bae et al., 2019). In our study we use Boxplot to measure the variation in the employment status of the individual in pre and post lockdown period.

Figure 1: Variation in the employment status of the individual

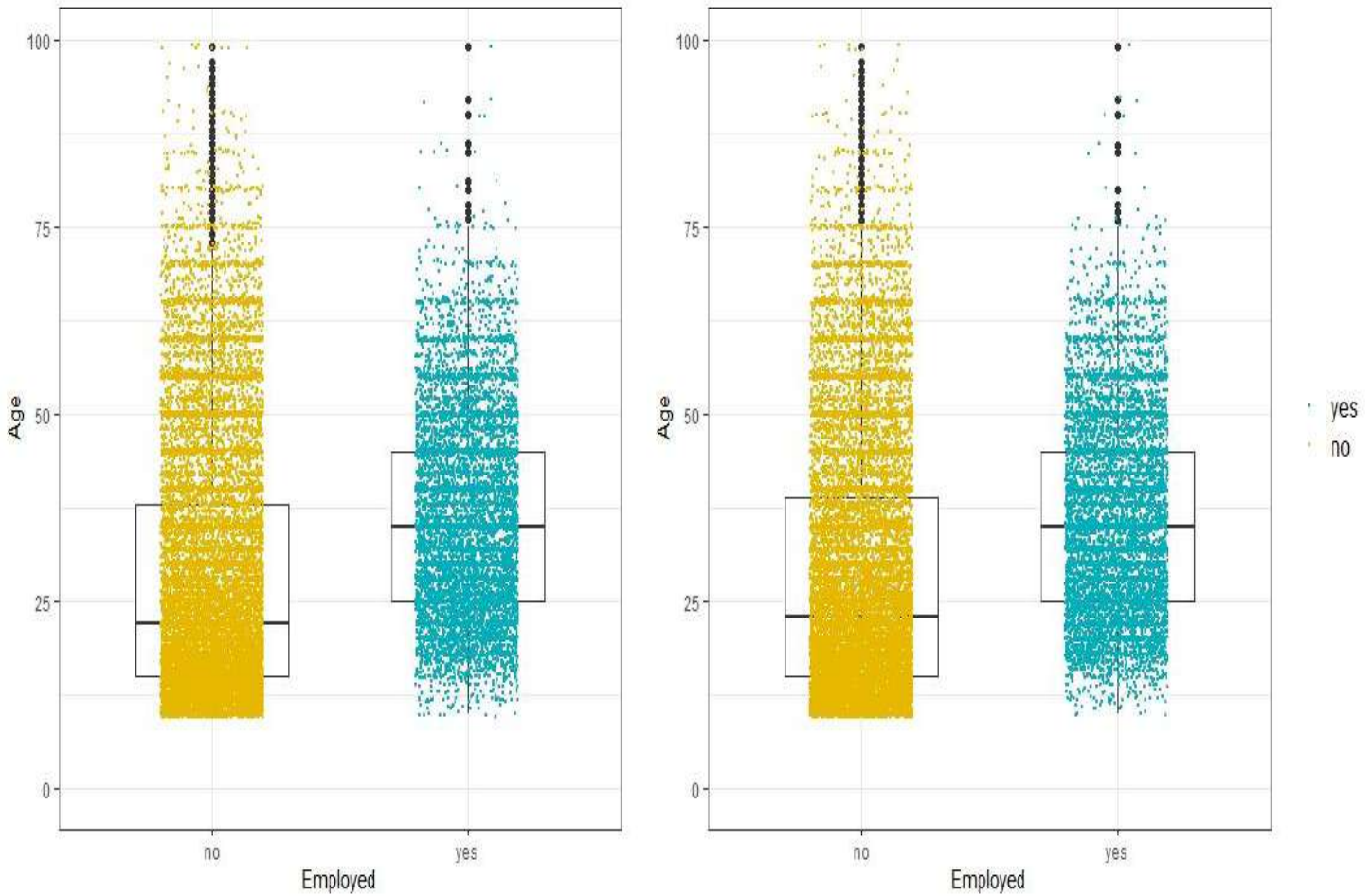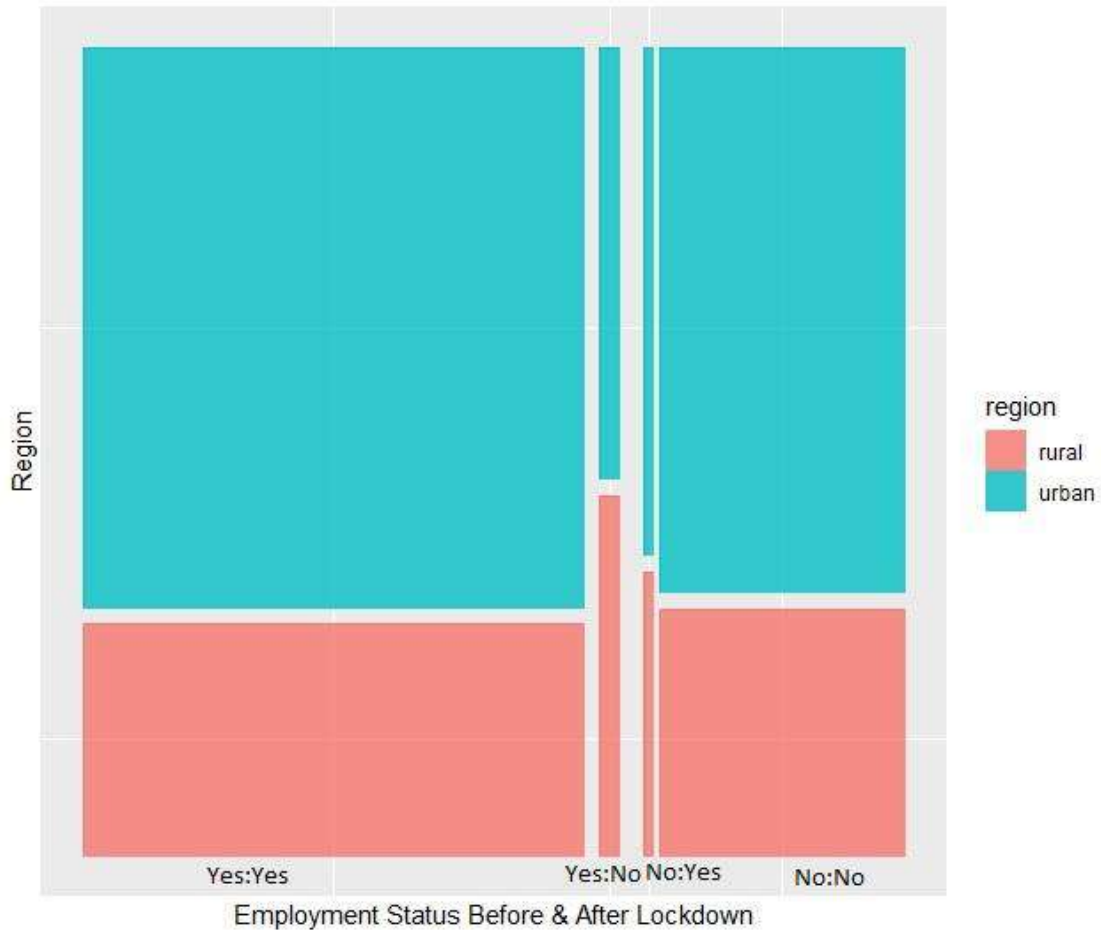| a) Pre lockdown period | b) Post lockdown period |

Figure 2.1. Shows the response of the individuals in term of employment in the pre and post lock down period. In accordance with the boxplot, variation occur in the employment level between the two time periods i.e. the work force with no employment increases after lockdown. The increase in the size of the Inter quartile range (IQR) in the above boxplot (Post lock down period) shows this change. However, this variation mostly occurs in the young working population. The working population having age 25 or below faces the job loss in the post lock down period. Our results are consistent with the study "The impact of the COVID-19 pandemic on jobs and incomes in G20 economies", conducted by the ILO-OECD, 2020). This study observed the similar results that the job losses between December 2019 and April 2020 were more for younger working population aged 25 or below than for adults in G20 countries. According to this study nearly 67% of the young people in the G20 countries are working in the informal sector so that's why they are more vulnerable to the job and income loss during as a consequence of COVID-19 pandemic.
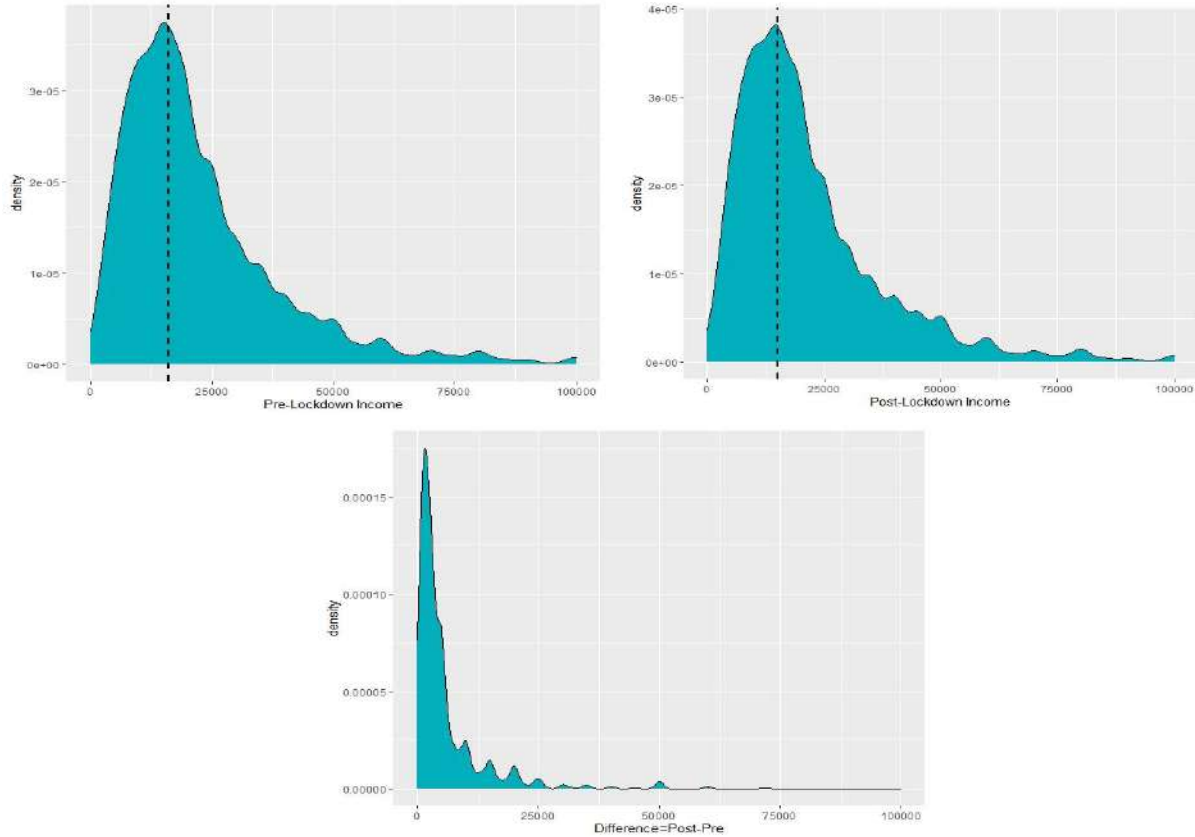
Above graph shows the employment status of the individuals in urban and rural region. The graph captures the responses regarding their employment before lockdown was implemented versus after lockdown. According to the graph working population of rural area is more affected due to the COVID-19 lockdown policy. In accordance with Labour Force Survey (LFS), the working population percentage in rural region that belongs to informal sector is more than 60% and as in Pakistan the lockdown policy hits the informal sectors the most (Final report for Covid-19 survey, PBS), the employment status of the rural region work force is more affected as compare to the urban region work force.

Evaluating Income change Pre and Post Lockdown

In order to access the effect of lockdown policy on Income variable between Pre and post lockdown period we used the methodology presented in (Estrada, Ferrer, & Pardo (2019) for one group design. One group design do not require a control group to compare the effect of treatment as in case of lockdown treatment policy, sample remained same in pre and post time points. Our analysis will measure two types of changes in income variable. Average based change (ABC) will provide the evidence about the change in centre of the distribution, whereas Individual based change (IBC) evaluates that change is experienced at individual level. Figure 1 explains the pre-post and change in two time period distributions. Income is

highly skewed and most of the observations are bounded to one hundred thousand a month on average.

Figure 2: Variation in the income status of the individuals in Pre and Post lock down period

Median income decreased 1 thousand post-lockdown compared to average income in pre-lockdown. In order to evaluate average and individual based changes we have data from treatment group only and used following criteria.

a) ***Sample size of each group (n)***
Sample size consisted of 22600 individuals which remained same in two time periods i.e. pre-lockdown and post-lockdown.

b) ***Pre-post correlation (ρ pre−post)***
We used the Pearson's correlation coefficient observe that the value of pre-post correlation. The resulting value of 0.88 shows a high correlation in income at two different points.

c) **Shape of the pre and post income distributions**
We estimate the shape of the pre-post distributions by measuring the degree of skewness and kurtosis. Income is highly skewed in both time points as the value is greater than 1. Also the shape has greater kurtosis than the normal distribution.

d) ***Effect Size in the treatment group***

Effect size is a quantitative measure of the magnitude of experimental effect in treatment group. It measures the sizes of difference between the group means. We calculated the mean difference of pre and post lockdown income of two groups by standardized mean difference of two time points.

e) Average based changes (ABC) Statistics
We calculated the empirical group or average change in income of household between two time periods by estimating the difference between the post and the pre-test means, and dividing such difference by the standard deviation of the differences.

$$d = \frac{(M_{post} - M_{pre})}{S_{dif}} \qquad (1)$$

f) Individual based changes (IBC) Statistics
In order to estimate the variation in the income at individual level between the pre-post lock down period we used Reliable Change Index (RCI) scores to calculate the individual scores.
Reliable Change Index (RCI) is considered as a popular individual change index based on standard error of measurement.

$$RCI = \frac{Di}{\sqrt{(S_{pre}\sqrt{1 - R_{pre-post}})^2 + (S_{post}\sqrt{1 - R_{pre-post}})^2}} \qquad (2)$$

Once we have the scores at individual level we applied one sample one tailed t test to find the reliability of change at individual level. If the mean of RCI significantly greater than 1.645 the difference is reliable and the change of magnitude would not be expected due to unreliability of the measure.

Table 1: Summary of Sample Conditions and Computed Statistics

Sample size	n_{exp}	22600	
Pre-Post Correlation	$\rho_{pre-post}$	{0.88}	
Shapes of the Pre-Post distributions	*Skewness:*	30.2 (Pre)	1364 (Pre)
	Kurtosis:	27.63(Post)	1088 (Post)
Average based changes (ABC) statistics	d=(M$_{post}$ − M$_{pre}$)/S$_{diff}$	-0.0036	
Individual based changes (IBC) statistics	Based on Reliable Change Index (RCI)	One-Sample t-test H0: mean equal to 1.645. H1: mean greater than 1.645.	

Results and Discussion

Figure 2 explains the variation in income after lockdown policy intervention, the density plot is negatively skewed in post lock down period compare to pre lock down which means that most of the observations lied below the median income. Pre COVID -19 lock down policy the median income of the individual is 16000 which feel down to 15000 post COVID-19 lock down policy. This shows that there is a significant negative impact of lock down policy on the individual income status.

Sample Group	Mean	Median	Difference in median (Pre-Post)	Cohen's d	Reliable Change Index (t-test)

				Statistics	
Pre-Lockdown Income (in PKR)	22817	16000	1000	0.0036	-2.2073 (0.9863)
Post-Lockdown Income (in PKR)	22719	15000			

Our estimated Average based changes (ABC) statistics through Cohen's d is -0.0036 shown in Table 2.1. Here we get the negative sign because we calculate the difference by subtracting income in pre lockdown period from income in post lock down period. This negative sign is the clear indication that the lock down policy negatively affected the individual income and individual had to face the decline in their income level in post lock down time period. However, if we change the order of the two sample and take difference by subtracting the post income from pre income of the individual, which does not affect the magnitude of Cohen's d whose value became 0.0036 shows that there is negligible change on average on treatment group. Since the on average variation is negligible as discussed above it is important to move toward the individual level change. To estimate the individual level change statistics firstly we measure the reliable change index (RCI). After applying the one tailed t-test our p-values does not support the null hypothesis and the mean value of the RCI was significantly greater than 1.645 which shows that there is reliable variation in the income of the individuals in pre-post lock down period.

Conclusion and Policy Recommendations

In this paper we estimated the impact of resulting lockdown policy due to COVID-19 pandemic on the income at individual level by using the Average based change (ABC) statistics and Individual based change (IBC) statistics approach. On the other hand we measure the change in the employment status between the two time period i.e. pre and post lock down policy period through visual analysis by using the boxplot graph. Our results shows that there is a significant impact of COVID-19 lock down intervention on the employment status. Moreover, this variation mostly occurs in the young working population. The working population having age 25 or below faces the job loss in the post lock down period. However, in the case of income our results shows that there is negligible change on average on treatment group income status but while estimating the individual level change statistics using the reliable change index (RCI) we observed the significant variation in the income of the individuals in pre-post lock down period.

Government of Pakistan as an immediate response to the COVID-19 pandemic expand the Ehsaas emergency programme from 4.9 to 12 million households and decided to distribute 144 billion rupees at 12000 rupees per household, and also providing cash grants of 158 billion rupees to nearly 3 million daily wagers in the formal sectors. Government also provide food subsidy of 50 billion rupees for the lower income group. These initiatives of government even though provide some aid to the people in term of food security in short run

but these are not sufficient steps for the long run. Government need to take some effective steps for the long run to compensate or reemployed the people especially young working population who lose their jobs and incomes due to COVID-19 lockdown period. Following are some policy recommendations:

1. The government may take the valuable steps to strengthen the jobs and social security system to cover all affected working population and ensure that besides helping them through cash transfers to cope with this pandemic situation which benefits in the short run, policies should be design that concentrate more on risk reduction and providing financial security in the long run also.
2. Government may encourage and provide the support like reduction in business transfers to government or allowing the delay in the tax payment etc. to the self-employed or small and medium sized enterprises (SMEs).
3. Promoting and encouraging the lifelong learning opportunities or trainings for everyone to meet changing demands for skills. The special focused should be the group of people having low digital literacy so that they may be able to work online.
4. Teleworking is now proven to be essential element for continuity of business. Steps may be taken by public and private employment sector to promote digital services so that there will be possibilities for staff teleworking arrangements so that the policy infrastructure should already be in place and can be easily scaled up when any crisis situation occur.

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