**AN ANALYSIS OF POWER OUTAGES INDUCED ELECTRICITY BACKUP CHOICE IN PAKISTAN**

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**Abstract**

Regular electricity supply is essential for economic growth and wellbeing in a modern economy. In general, supply from electricity grid is the main source of power wherein the grid comprises of interconnected transmission and distribution networks for connecting electricity consumers to power plants. Supply must match the demand in the real-time for a reliable and regular electricity supply and in case of any discrepancy; system is managed by power cuts for certain set of consumers. Power cuts or supply disruptions are generally termed as power outages or load shedding and is quite common in Pakistan. The country has a long history of overlapped energy crises especially since 1980s that are stated as an outcome of inadequate planning and short-term policy choices.

Outages are costly for consumers and firms and the cost generally increases with frequency and duration of power supply interruption. Economic theory suggests that consumers will go for alternate energy devices if cost of unmet electricity demand due to outages exceeds the cost of available backup energy source. Past crises weaken the perception of electricity consumers about the public utility’s capacity to timely and adequately plan and manage power supply. As a result, people choose among alternative back up options including uninterrupted power supply (UPS), natural gas or gasoline based electric generators and solar systems. This study finds the determinants of this choice based on the consumers perception regarding the power supply system. It uses a primary data collected from 952 respondents in the twin cities of Islamabad and Rawalpindi, Pakistan. This study employs multinomial logistic regression to cater for the multicategory nature of our dependent variable i.e., backup choices. Multinomial logistic regression utilizes maximum likelihood estimation to compute the probability of categorical membership.

The results show that house ownership has a positive and significant impact on the choice of electricity backup as it favors all the options as compared to the base category of no backup. Interestingly, the electricity theft and consumer satisfaction variables are detrimental to opting the solar technology. The UPS and small generator are more likely the choice if consumption is within the range of 300-700 units per month however, chances of solar system adoption increases if it exceeds 700 units per month. Education of the respondent is positively and significantly affecting the backup choice and for solar technology adoption, it is true only for university graduates. The findings have important policy implications. The transition towards the solar energy is mainly driven by the household strategy for maintaining energy backup therefore, it is pertinent to provide microfinance facilities. Moreover, the energy sector reforms need to be improved for efficient electricity supply system that help avoiding inefficient backup options.

Results Table: Relative Risk Ratios for Backup Choices

|  |  |  |  |
| --- | --- | --- | --- |
| **Base: No Backup** | **RRR-UPS** | **RRR-Generator** | **RRR-Solar panel** |
| Residential Status (Base: Rented House) |
| Govt. Residence | 2.74\*\*\* | 2.28 | 8.66\*\*\* |
| Own House | 1.52\*\*\* | 2.80\*\*\* | 2.53\*\*\* |
| Region (Base: Islamabad Rural) |
| ISB Urban | 1.49\* | 2.68\*\* | 1.70 |
| RWP Urban | 1.75\*\*\* | 3.42\*\*\* | 1.51 |
| RWP Rural | 0.16\*\*\* | 0.001 | 0.64 |
| Employment Status (Base: Unemployed) |
| Self-employed | 1.63 | 1.08 | 0.54 |
| Govt. Employed | 2.04\*\* | 0.56 | 1.58 |
| Informal Sector | 1.22 | 0.40\* | 1.20 |
| Pvt. Employ | 1.25 | 0.74 | 1.10 |
| Electricity Consumption (Base: Units<300) |
| Units(300-700) | 2.87\*\*\* | 6.81\*\*\* | 1.44 |
| Units(>700) | 2.81 | 17.17\*\* | 11.01\* |
| Education (Base: Education<10) |
| Edu(11-16) | 1.99\*\*\* | 2.18\*\* | 1.24 |
| Edu(>16) | 5.33\*\*\* | 4.33\*\*\* | 4.11\*\*\* |
| Gender (Base: Female) |
| Male | 0.58\*\*\* | 0.99 | 1.18 |
| Monitoring | 0.82 | 0.57\*\* | 1.03 |
| Theft | 0.87 | 0.68\*\* | 0.55\*\*\* |
| Consumer Satisfaction | 0.94 | 0.87 | 0.48\*\*\* |
| Family Size | 1.02 | 1.03 | 1.10\*\* |
| Income | 1.00\*\* | 1.00 | 1.00 |
| Intercept | 0.80 | 0.59 | 1.13 |
| Observations=952 | LR Chi2(57)=3017.32 | Prob>Chi2=0.0000 | Pseudo R2=0.1451 |