

EFFECTS OF COVID-19 ON INDIAN ENERGY CONSUMPTION

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Overview

The COVID-19 pandemic has forced governments around the world to impose tough restrictions on daily life to prevent the spread of the virus. With these restrictions, roads and airports are nearly empty, shops and restaurants are closed, and industrial activities are largely at a halt worldwide. International Energy Agency (IEA) 2020 asserts that the reduction in the energy demand after the lockdown occurs due to a decrease in the demand from the service and industry sector. However, the amount of energy consumed in the service and industry exceeds the household use, and thus, lockdown, in general, have a negative impact on energy consumption. Therefore, in many countries, the energy demand plummeted after the lockdown as the level of industrial activities shrunk, and it only started to surge when business restarted as restrictions relaxed. Just after the Indian government issued the first lockdown rule to cope with the increasing COVID-19 cases in March 2020, the energy consumption in India plummeted dramatically. However, as the lockdown relaxed, energy consumption started to recover. India's power consumption shrunk 9.24% and 22.75% in March and April, but this slump in power consumption narrowed down in May to 14.16% (The Economic Times, 2020).

However, since the world is still far from controlling the pandemic, not much is known about how increased COVID-19 is affecting energy consumption. To shed light on this issue, this study investigated how COVID-19 cases affected Indian energy consumption during the COVID-19 crisis by testing if the lockdown release has a positive impact on energy consumption and if richer regions are quicker to recover their energy consumption to level before the lockdown. As the use of the autoregressive model is becoming popular for analyzing the changes in the spread of disease through time (Allard, 1998), our study is also modeled under this model. Using the autoregressive distributed lag (ARDL) model, the study reveals that a long-run relationship holds between the COVID-19 cases and energy consumption and that the COVID-19 cases have a positive effect on the Indian energy consumption.

This result indicated that as lockdown relaxes energy consumption starts to recover. However, such a positive impact was not apparent in the Eastern and North-Eastern regions, which are the poorest regions among the five regions investigated in the study. This implies that poorer regions need special aid and policy to recover their economy from the damages suffered from the COVID-19 crisis. The current study is the first study to investigate how energy consumption is affected by the COVID-19 pandemic in India and how the effects might be different among the five geographical regions of India. As the COVID-19 is causing devastating impacts on the world's energy markets, the study will not only contribute to understanding how the coronavirus shock has influenced the Indian energy sector but will also become a good reference for analyzing the effects of the pandemic on the other countries' energy sector.

Methods

To capture the effects of the changes in the COVID-19 cases on energy consumption, we used the log series of the COVID-19 and energy consumption data. Hence, all our analyses are performed using the log form of the series. To identify both the short-run and long-run relationships between the Indian energy consumption and the number of accumulative confirmed COVID-19 cases, we used the ARDL model developed by Pesaran et al. 2001. As not much time has passed since the spread of COVID-19, it was not possible to obtain a large sample data. This is one of the main reasons we used the ARDL model because this model has its strength even when the sample size is small and can avoid omitted variables and auto-correlation issue.

To use the ARDL model, the endogenous variables in the model must be either integrated of order zero or one. To test this, we initially performed the stationarity tests on energy consumption and COVID-19 variables. For this purpose, we performed the augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests. All three unit root tests suggest that the Energy consumption variables of the Western Region (WR), Northern Region (NR), and Eastern Region (ER), and the COVID-19 variable for the Southern Region (SR) are integrated of order one at the 5% significance level. The unit root tests suggest that the other variables are also either integrated of order zero or one, suggesting all our test variables satisfy the precondition of the ARDL model.

Results

We estimated the ARDL model to investigate if the daily changes in the total accumulative number of COVID-19 cases in India along with five regions have an impact on its daily energy consumption. It is observed that the daily changes in the accumulative number of COVID-19 cases had a statistically positive effect on the daily energy consumption of all India, NR, WR, and ER based on the 5% significance level. SR was only significant at the 10% level, but the direction of the impact indicates that the COVID-19 cases influence positively on energy consumption. It is also noticeable from the result of the SR and ER models that the total COVID-19 cases of one day before negatively impacted the energy consumption.

Besides, COVID-19 did not have a significant short-run impact on energy consumption in the North-Eastern Region (NER). Besides, the Net State Domestic Product (NSDP) per capita of NER is the lowest among the five regions and it could be that this region was less solvent compared to other regions for recovering its economic activities to period before the COVID-19 outbreak. Furthermore, the level of the growth of COVID-19 cases for NER was severer compared to other regions even after mid-May, and thus, its energy consumption remained stagnant after the lockdown relaxation. This could be also the reason for the NER not having a statistically significant effect from the COVID-19 cases.

Finally, as all India, NR, and WR had a cointegration relationship between the COVID-19 cases and energy consumption, we present the error correction model of these regions. All these regions show a positive impact from the COVID-19 cases to their regional energy consumption levels. This indicates that in these regions, the COVID-19 cases had a positive impact on their energy consumptions.

Conclusions

As the COVID-19 spread out worldwide, India was not an exception to have many people getting infected to the virus and the government had to impose severe stay-at-home restrictions. The energy consumption in India plummeted dramatically by the end of March 2020 because of this lockdown regulation. However, since the end of April, energy consumption started to recover as the regulation relaxed.

This study investigated how India has recovered its energy consumption after the decline in its energy consumption in March 2020. We investigated if the release of lockdown positively influences the energy consumption and if this positive reaction differs among regions at different average income levels. We examined if regions with higher income levels are more likely to recover their energy consumption to pre-crisis levels faster than those with lower income levels. This implies that even during the middle of the spread of the pandemic, energy consumption increases as lockdown regulation relaxes.

However, we found that this recovery of energy consumption is not occurring in the ER and NER. These two regions are the poorer regions among the five geographical regions investigated in this study. In India, the level of energy consumption is strongly connected to household income levels and reduction in energy consumption indicates that the individual's economic conditions are deteriorating.

Therefore, the result of our study revealing poorer regions struggling to recover their energy consumption to levels before the pre-COVID-19 crisis implies that the economic damages on these regions were more critical than the regions with a higher average income level. This suggests the importance of providing special economic aids and policies for these two regions to recover their economy to levels before the pre-COVID-19 crisis. Our study is limited in a way that it only used short-term data since the study was performed in the middle of the COVID-19 pandemic. We would like to notice that the results are likely to change when the same analyses are performed using different periods since the effects of the COVID-19 is changing as time passes.

References

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