

ASSESSMENT AND DETERMINANTS OF ENERGY SUPPLY SECURITY IN PAKISTAN: AN EMPIRICAL ANALYSIS

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Overview

Energy security implies the provision of reliable and adequate supply of energy at reasonable prices in order to sustain economic growth (Anwar, 2010). Access to sustainable, reliable, clean, secure, equitable and affordable energy is essential for economic growth. Energy security emerged as an important topic globally in the later part of 19th century and early part of the 20th century. This issue was discussed at greater length during 1970s due to high oil prices and geopolitical supply tensions (Cherp and Jewell et al., 2014). However, in 1980s and 1990s, with the stabilization of oil prices, scholars' interest declined in the study of this issue and re-emerged in the 2000s due to rising energy demand in Asia, stress to de-carbonize energy systems and disturbances of gas supplies in Europe. Following the suit, energy security is also being debated in Pakistan on account of a number of reasons.

Pakistan is experiencing severe energy crisis since 2006, which deepened in 2012, has adversely affected economic activities in the economy. The impacts of energy shortages in Pakistan are visible in dwindling economic growth rates, falling exports, increasing unemployment rate and reduction in overall production activities in the economy. The worsening of these macroeconomic indicators also translated into other social indicators of Pakistan. Energy demand in Pakistan is increasing more than primary energy supplies due to industrial and technological advancements, inefficient use of energy resources and limited explorations. These energy shortages are responsible for reduction in GDP growth rates by 2-3 percent annually. Global estimates suggest that Pakistan is among the highly energy insecure countries in the world. Pakistan's energy security risk score increased from 1417 in 2011 to 1,495 in 2012 resulting in worsening of Pakistan's rank in energy secure countries from 64 in 2011 to 73 in 2012. Similarly, Pakistan's rank worsened from 88 in 2011 to 92 in 2012 in energy sustainability index of world energy council (2012). Pakistan is endowed with abundant domestic energy resources however; country's electricity production is still dependent on imported fuel with improper pricing of indigenous fuels and their exploitative consumption. The overall energy mix of the country suggests that 64 percent of country's electricity is thermal based. Most of the oil to produce electricity in the country is imported. This highly skewed energy mix also puts Pakistan on risk of being affected from any adverse supply shock in terms of increase in international oil prices. Any global supply shock can have server implications for masses in terms of energy affordability and accessibility. Most of the quantitative studies in this area have focused on analysis of energy security with respect to regions and have intended to explain differences in energy security situation between countries. In the current study, we plan to highlight the domestic factors contributing to the issue in detail for the case of Pakistan.

Methods

We contribute to the existing literature by proposing breakdown analysis and looks into different dimensions of energy security in Pakistan using 4-A's framework from 1980 to 2014. Specifically, we study energy security in terms of Availability, Applicability, Affordability and Acceptability in the country specific context. Based on these four dimensions, we develop a composite index to comment on the level of energy security in Pakistan. The variations in these different dimensions of energy security have been explained using rhombus plots and an econometric model has also been developed to assess the effect of different determinants on these energy security indices. Johansen's approach to cointegration has been employed to assess the impact of different variables on level of energy security in the country.

Results

The results of energy security assessment reflect that availability dimension showed an overall increasing trend throughout the study period. The total score increased from 3.04 in 1980 to 7.48 in 2013. The sharp increase in energy availability during the 1990s was due to the induction of independent power producers in electricity generation capacity in the country. However, Pakistan's energy resource availability did not remain stable from 2006-2013 and increased specifically in 2013 due to gas reserves discoveries in 2013. The trend of applicability dimension shows that it remained almost stagnant till 2000. It increase exponentially afterwards till 2008 but declined sharply afterwards due to decline in industrial sector energy intensity on account of slowing down of economic activities in the country. Moreover, the average value of acceptability dimension shows that social acceptance of energy resources has been increased smoothly from 1980s and onwards. From 2006 to 2013, there are fluctuations however notable drop happened in 2008 to the smallest value of 6.72 due to economic recession during this year. Energy crisis impacted the rate of production which also resulted in absolute reduction in co2 emissions. The average value of affordability gradually increased from 1.04 in 1980 to 4.31 in 2013 with decline in 2008 and fluctuations thereon. The reasons for the drop in affordability included high oil prices resulting in higher electricity prices, withdrawal of energy subsidies to consolidate fiscal accounts by the government and the decline in per capita energy use in the economy. The econometric model suggests that energy prices, energy imports, population and energy generation from renewable resources are significant determinants of energy supply security in Pakistan.

Conclusions

The results reflect that the level of energy security has declined during recent years in aggregate index as well as in terms of availability, applicability, acceptability and affordability. Energy generation mix of Pakistan is highly skewed towards imported non-renewable energy resources and carries wider implications for the economy. The energy security situation in Pakistan can be improved by investing in renewable energy resources and reduction in energy intensity by introducing energy efficiency measures. Application of sectoral energy intensity reduction targets can be important policy steps to meet the desired objectives.

References

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