

IMPACT OF POWER OUTAGES ON FIRMS EFFICIENCY IN ASIAN EMERGING AND DEVELOPING COUNTRIES

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Overview

World Energy Outlook (2016) reported that more than one billion people have limited access to electricity consumption around the world. In line with this report, the World Bank Independent Evaluation Group (2015) also highlighted that over one billion people are unable to get reliable or adequate electricity services. Developing and less developed countries account for approximately 75 percent of the world total population but they consume only 30 percent of total global energy. Both industrial and residential sectors are suffering from unsatisfied demand of energy. Due to power outages and shortage of fuel productivity of different sectors is being affected negatively. One of the parts that are highly influenced by power outages is firm efficiency.

According to 2016 World Bank Enterprise Survey Data, power outages perceived as the high resistance to business activities by 12% of business owner in developing countries. Further, it reveals that the most firms in Asian emerging and developing countries¹ are facing frequent power outages. Over the years, for these countries, the survey indicates that power outages is a major obstacle to their firm's activities and have a negative impact on firm efficiencies. Asian emerging and developing countries are contributing in the world's gross domestic product (GDP) is about 32% in 2017 and the annual average growth in real GDP of Asian emerging and developing countries amounted to about 7.43 % (IMF, 2017). These numbers are indicating the significance of this region in the world economy.

Developing countries can reach to the goal of economic growth by increasing the Firm's output and productivity (Abotsi et al., 2014). Therefore the idea to investigate the influence of power outages on firm production efficiencies of Asian emerging and developing countries cannot be overstated. The concept of firm efficiency is regarding as producing high amount of output, as possible as it can, with given inputs. The goal to increase the firm's production efficiency is an important objective not only for firms but also for economic policy makers to increase economic growth.

Numerous studies in the area of power outages and firm output have studied the impact of power outages on firm's output (Eberhard et al., 2011; Alam, 2013; Adenikinju, 2005). However, only a few have estimated the impact of power outages on firms efficiency. Among them, Cissokho and Seck (2013) investigated an impact of power outages on firm efficiency by using Data Envelopment Analysis (DEA). They found a negative impact of outages on firm's scale efficiency. And the DEA method they used has some drawbacks related to error assumptions, as errors in estimation and random disturbances in the dependent variable are interpreted as the technical inefficiency.

Our study contributes to the empirical literature by analyzing the impact of the number of power outages on firms efficiency for the 18 Asian emerging and developing countries over the period from 2009-2016. In order to do so, we use cross sectional data collected from World Bank enterprise surveys and apply stochastic frontier analysis (SFA) approach to estimate the relationship. To the best of our knowledge this is the first study for the Asian emerging and developing countries in the context of the impact of power outages on firms efficiency. The selected group of 18 countries is depending upon the data availability. Furthermore, by focusing on Asian emerging and developing countries we aim to shed light on the importance of good infrastructural quality for a sustainable growth path in one of the fastest growing regions in the world.

Methods

To estimate the impact of power outages on firm efficiency in Asian emerging and developing countries, firm level secondary data is collected from World Bank Enterprise Surveys. Due to large data availability on manufacturing sector we include only manufacturing sector of firms in our analysis. World Bank has surveyed same manufacturing questionnaire for different countries at different time periods. We retrieve data for 18 Asian emerging and developing countries for time periods 2009, 2011, 2012, 2013, 2014, 2015 and 2016. The study applies stochastic

¹ By definition of the IMF, Asian emerging and developing countries are: Bangladesh, Bhutan, Cambodia, China, Fiji, India, Indonesia, Malaysia, Mongolia, Myanmar, Nauru, Nepal, Philippines, Solomon Islands, Sri Lanka, Thailand, Vanuatu, Vietnam (IMF 2017).

frontier analysis (SFA) approach proposed by Aigner et al. (1977) on cross sectional data. To investigate the objective of this research the study used following translog model:

$$\ln y = \alpha_o + \sum_{j=1}^3 \alpha_j \ln x_j + \frac{1}{2} \sum_{j=1}^3 \sum_{k=1}^3 \gamma_{jk} \ln x_j \ln x_k + (v_i - u_i)$$

where $\ln y_j$ is the natural log of total annual sales of firm and $\ln x_j$ represents the logs of inputs. α_o , α_j and γ are parameters to be estimated. u_i is a random variable and representing technical inefficiency of firm. v_i denotes the stochastic error term. The vector of inputs is including labor, capital, energy and power outages. Labor is measuring as permanent full time workers. Capital is denoting as total annual expenditure for equipment, land and buildings purchases. The input variable of energy is captured as expenditures of fuel and electricity (Abotsi, 2016). The power outages variable is measured by monthly average number of outages. Controls variables like country dummies, time dummies, industry dummies, firm size dummies, female owners, generator owners, quality certifications are also used. The impact of power outages on firms efficiency is estimated by three cross sectional SFA models, Half-normal model (Aigner, Lovell and Schmidt, 1977), Exponential model (Meeusen and van Broeck, 1977) and Truncated normal model (Stevenson, 1980). We also employ model proposed by Battese and Coelli (1995) to capture the effect of power outages on inefficiency in single equation model.

Results

The translog parameter estimates indicate highly significant elasticities of labor, capital and energy that are 0.35, 0.17 and 0.61 respectively by all models. The greatest elasticity observed is that of energy. This highlights the strong association that exists between production and energy. The variable of labor discloses the second larger elasticity, validating the importance of labor to the production process. The elasticity of capital also shows a sizeable input to the production process. The impact of power outages is highly significant and having negative impact on firm output. The elasticity of power outage variable is -0.11 (Abotsi, 2016). According to the results of Battese and Coelli (1995) model power outages have highly significant impact on firm inefficiency in Asian emerging and developing countries in the presence of firm control variables. These results are in line with the study of Moyo (2013), Alam (2013) and Cissokho and Seck (2013).

Conclusions

After the report of World Bank Enterprise Survey, that power outages are main obstacle to firm performance and productivity. This study attempt to investigate the influence of power outages on firms efficiency in Asian emerging and developing countries. By using cross sectional data on 18 Asian emerging and developing countries for the time period of 2009 to 2016 collected from World Bank Enterprise Survey. The study employs Stochastic Frontier (SFA) approach to estimate the model. The results indicates that increase in power outages influenced significantly negative to the firm performance and efficiency. These findings are consistent with the results of by Moyo (2013) and Cissokho and Seck (2013) that found that power outages have potential negative effects on firm productivity. As energy resource of the country can determine economic growth and development, our results also indicating the strong relationship between energy and output production. The results of this study are suggesting some policy implications to policy makers regarding improving in the conditions of energy supply and chalk out some alternative ways to avoid the power outages. There should be proper information and schedule of power outages and firms should be informed accordingly to plan their production activities efficiently.

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