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The Economic Costs of Unsupplied Electricity: Evidence from Backup Generation among African Firms

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Public provision of electricity in Africa has been marred by under investment and irregular power supply. In 2007 for instance, an average Sub-Sahara African firm suffers the loss of economic activities for about 77 hours a month due to power outages. This is compared to just 15 hours and 6 hours monthly outages experienced by firms in East Asia & Pacific and in Latin America & the Caribbean, respectively. Poor electricity supply has proved to be the major constraint to the business sector in Africa and has contributed to the low productivity and poor competitiveness of the manufacturing sector in the continent. Between 2006 and 2010, more than 50% of the Sub-Sahara African firms identified electricity as a major constraint to their businesses compared to 27.8% that named transportation as the most critical problem. To cope with this poor public supply, one of the strategies often adopted by firms is investment in own generation.

Some studies have shown that investment in auto generation by firms in the wake of power unreliability could be driven by firms' characteristics. However, it is not clear whether firms possessing those characteristics suffer more or less unmitigated outage loss (total possible outage loss minus the prevented loss through own-generation) because of their potential to generate their own electricity.

Using cross-sectional data from 6854 firms currently operating in 12 African countries, we study the extent to which firms' characteristics might create incentives for auto-generation and whether these incentives lead to more or less unmitigated outage costs. The results reveal that large firms, firms engaging in exports, and those using the Internet for their operation still suffer higher unmitigated outage costs despite having a higher propensity of investing in own generation. While smaller firms are unable to mitigate between US$0.12 and US$1.26 outage cost (loss) per kWh, larger firms suffer between US$0.58 and US$ 3.20 per kWh despite having a higher tendency to invest in own generation. These costs are significantly higher than the cost of grid supplied electricity which ranges between US$0.03 and US$0.24. Similarly, firms engaging in exports are unable to mitigate between US$0.47 and US$3.00 per kWh despite having a higher probability of investing in own generation. These costs are compared to between US$0.20 and US$2.52 per kWh incurred by firms without export engagement despite having a lower propensity of investing in own generation. Although firms' characteristics tend to increase the decision to demand backup capacity, majority of those firms run significantly less backup capacity compared to their energy needs. This low backup makes them vulnerable to power outage.

Further results reveal that unmitigated outage costs still account for the larger proportion of the total outage costs despite high prevalence of backup ownership among the firms. The shares of the per kWh unmitigated outage costs range from 46% - 73% of the total outage costs. This high proportion of unmitigated outage costs reflects the inefficiency in backup generation due to small backup capacity held by firms. The analysis further suggests that firms can still benefit significantly even when the current subsidised tariffs are replaced by cost-reflective rates that ensure stable electricity supply. The net outage cost (having adjusted for a cost-reflective tariff) incurred by firms are large enough to expand their scope of operation and hire more workers, suggesting the macroeconomic effect could be significant.

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