The Effect of Power Outage on Micro and Small Enterprise Productivity: Evidence from Urban Ethiopia

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Abstract

For this study, we conducted a cross-sectional survey of 8174 micro, small and medium enterprises from ten major urban areas in Ethiopia to study the effect of power outage on their total factor productivity (TFP), labor productivity and revenue. Our results found that a one percent increase in the average duration of power outage is associated with 0.54%, 0.17%, and 0.19%, decrease in TFP, labor productivity and revenue, respectively. These results are consistent with previous studies in other sub-Saharan African countries and Asia. They suggest that power outage serves as a negative shock to productivity and revenue of enterprises by creating a constraint on production process. They also imply that providing sustainable and reliable power should be taken as a top priority in order to improve the overall performance of micro, small and medium enterprises.

Keywords: Power Outage, Total factor Productivity, Labor Productivity, Revenue, Ethiopia

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1. Introduction

Evidence shows that access to quality physical infrastructure is a prerequisite for any country's structural transformation and transition to higher economic and societal deployment (Bolten and Foxen 2015; Mensah, 2016). Quality infrastructure reduces enterprises' production costs and harnesses their productivity, thereby improving profitability and competitiveness in the domestic and international markets. Power is one such element. However, many developing countries have limited access to quality electricity service and also suffer from frequent unscheduled interruptions (John and Jones, 2006).

In Ethiopia, power outage has always been a problem, sometimes occurring so frequently that people and enterprises often consider it as part of their life. According to the World Bank Enterprise Survey (2015), in a typical power outage day, on average the power outage can last for about 8 hours. It is one of the biggest challenges for production. Although the country has been making significant investment in the power sector over the last decade (about 40% of GDP), it has yet to resolve the problem of electricity shortages.

There are several reasons for this. One is related to the country's economic and population growth. Ethiopia's economy is one of the fastest growing in the world, with an average growth of 10.8% since 2005, and the demand for electricity is enormous, with demand outpacing supply. Another reason for outage is related to the source of electricity. According to Energypedia (2017), about 96% of the country's electricity is generated from hydropower which is affected by climatic conditions, including drought. Power outage can also be severe when there is any shortage of rainfall during the summer rain season.

Electricity is exceedingly expensive to store, and firms respond to power outage in different ways, generating electricity through diesel-fueled electric generators, shutting down their enterprises during power shortages (Allcott et al, 2014) or engaging in outsourcing to minimize productivity losses. Fisher-Vanden et al. (2015) found that firms provided substitution for energy intensive inputs and engaged in outsourcing of activities during outage periods. The effect of power outages on productivity and performance varied across firms depending on the type of response. For firms that used generators, the productivity effect comes through the impact on demand for other inputs while firms that shut down or outsourced found the power outage directly reduced their output and often caused the waste of non-storable inputs (Allcott et al, 2014).

There is growing empirical evidence on the negative impact of power outage on firms' productivity in developing countries other than Africa. For example, Allcott et al. (2014) found that a one-percent increase in power outage resulted in a 0.68% percent reduction in Indian manufacturing firms' revenue; Grainger and Zhang (2017) found that a 10 percent increase in the duration of outages on average led to a 0.14 percent decrease in Pakistan firms' total revenue and a 0.36 percent decrease in the value added.

The empirical evidence from Africa is thin and qualitative/descriptive in its nature. One exception is the study by Mensah (2016), who looked at the productivity and revenue effect of power outage on fifteen sub-Saharan African countries. Using the World Bank's Enterprise Survey, he found significant negative effects of electricity shortages on firms' revenue and productivity. As our review underlined, there has been no previous empirical study that tried to study systematically the impact of power outage on firms' productivity in Ethiopia. This study is, indeed, the first of its kind in Ethiopia in quantitatively testing the relationship between power outage and firms' productivity. We collected primary data in 2017 from a total of 8174 micro and small-scale manufacturing enterprises operating in Addis Ababa and nine major regional towns using a structured questionnaire, detailed enough to fully define the complex relationship between power outage and enterprise productivity.

Our results found that a one percent increase in the average duration of power outage is associated with 0.54%, 0.17%, and 0.19%, decreases in TFP, labor productivity and revenue, respectively. These results, consistent with previous studies in other sub-Saharan African countries and Asia, underlined that power outage serves as a negative shock to productivity and revenue of enterprises by creating a constraint on production processes. Our results also imply that in order to improve productivity and overall performance, providing sustainable and reliable power supplies should be a top priority.

In section two of this paper, we present the study area and data, followed by a brief conceptual framework. Section 4 discusses the empirical strategy of our study, and sections five and six provides the descriptive and econometrics analyses before conclusion.

2. Study Area and Data

The data source of this study is a unique firm-level survey conducted between December 2016 to June 2017 by the Ethiopian Development Research Institute (EDRI). The data was collected from micro and small manufacturing firms located in the 10 largest cities in Ethiopia with population size of 150,000 and above. The 10 cities were categorized into two broad groups: Addis Ababa, the capital, and regional cities3.

The overall sample size was determined on the basis of a balance of logistical constraints and the desired precision for outcomes. To get an estimate of the number of MSEs that operate in the 10 cities, we first conducted preliminary interviews with the relevant officers of Central Statistical Agency, Bureau of Labor and Social Affairs, the Addis Ababa Trade and Industry Bureau, the Addis Ababa Urban Job Creation and Food Security Agency (formerly the Addis Ababa Micro and Small Enterprise Development Agency) and Ethiopian Revenue and Custom Authority. The list of MSEs operating in both Addis Ababa and the 9 largest regional cities was collected from these institutions. The Addis Ababa Trade and Industry Bureau and the Addis Ababa Urban Job Creation and Food Security Agency were the most useful in providing names of enterprises operating in Addis Ababa.

The sampling frame for Addis Ababa, constructed by combining data obtained from these institutions, contained a total of 28710 enterprises. We trimmed firms with more than 50 employees from the sampling frame and remove duplicates as much as possible. Ultimately our sampling frame in Addis Ababa included 15,772 firms, of which 3066 were small firms. We, therefore, decided to conduct a census of all small firms in the city and generate a random sample of microenterprises. To draw up a sample of microenterprises in Addis Ababa, the 10 sub-cities within Addis Ababa were considered as 10 separate strata. A stratified sampling method was implemented to draw a sample of microenterprises from the 10 sub-cities. Reflecting the relative concentration of

[3] The study was conducted in Addis Ababa and nine other cities (Bahir Dar, Dessie, Dire Dawa, Gondar, Hawassa, Jigjiga, Jimma, Mekelle) all of which have large number of micro and small enterprises enterprises. The enterprises covered 15 economic sub-sectors with furniture and wood working, food and beverage, and metal working workshops, comprising 63.18% of the total, dominating. The remaining 36.82% were drawn from 12 different sub-sectors.

micro enterprises in Addis Ababa, 55% of our sample is drawn from the 10 sub-cities of Addis Ababa.

The frame used for the nine regional cities was also based on a similar approach with the important exception that there was no administrative data available from the regional bureaux of Labor and Social Affairs. We used the cities to stratify the sample, and the sample size in each regional city was determined by the population distribution of these enterprises as a sampling weight. Ultimately, we collected data from a total of 8174 firms using a structured survey instrument.

3. Empirical Model

To motivate our empirical strategy, we adopted the model developed by Allcott et al. (2014) and Mensah (2016). Following Mensah (2016), we assumed a Cobb-Douglas production function where electric power is taken as a direct factor of production like labor and capital.

$$Y_i = A_i K_i^{a_k} L_i^{a_L} E_i^{a_E} \quad \textbf{(1)}$$

Where Y_i is the output of enterprise i, K_i is stock of capital of the enterprise i, L_i is labor, E is electricity used by the enterprise i and A captures factor productivity. Further, a_K, a_L and a_E represent factor shares of capital stock K, labor L, and electricity E respectively.

In this model, we assume enterprises have two options during power outage, that is to respond either through self-generation or shut down. If f is the probability that the enterprise does not get electric power interruption, and $1-f$ is the probability of power interruption, the electricity input requirement of the enterprise can be written as the weighted average of electricity from the power distributer company (grid) (E_{ip}) and self-generation (E_{is}):

$$E_i = [f E_{ip} + (1-f) E_{is}] \quad \textbf{(2)}$$

Replacing equation (2) in (1) and multiplying it by $\frac{E_i^{\alpha_E}}{E_i^{\alpha_E}}$, we get,

$$Y_i = A_i K_i^{\alpha_k} L_i^{\alpha_L} E_i^{\alpha_E} \left(\frac{\varphi E_{ip} + (1-\varphi)E_{is}}{E_i} \right)^{\alpha_E}$$

$$= A_i K_i^{\alpha_k} L_i^{\alpha_L} E_i^{\alpha_E} W_i \qquad \textbf{(3)}$$

Where $W_i = \left(\frac{\varphi E_{ip} + (1-\varphi)E_{is}}{E_i} \right)^{\alpha_E}$, $0 \le W \le 1$ and it measures the weighted sum of self-generation and grid electricity shares of the total enterprises electricity requirement. Taking the logarithm on both sides, we get

$$y_i = a_i + \alpha_K k + \alpha_L l + \alpha_E e_i + w_i \qquad \textbf{(4)}$$

In Equation (4), total factor productivity (TFP) is given by the sum of a_i and w_i, where a_i>0 and $w_i \in (-\infty, 0]$. When there is no power outage (i.e. $\varphi = 1$), $TFP = a_i$. This means the enterprises' productivity factor is determined by other elements such as labor and capital. When there is power outage i.e. ($\varphi < 1$), and the enterprise does not generate its own electricity, this means, W<1, w_i <0, and hence, $TFP < a_i$. This means the enterprises' productivity is always reduced when they do not have a back-up generator of electricity. However, when the enterprise can fully replace the power shortage through self-generation, i.e., W=1, w_i =0, $TFP = a_i$, the total factor productivity remains unaffected. Because usually self-generation is more expensive than grid-based electricity, the power outage will negatively affect the enterprises' profits and leading to a reduced demand for other inputs thereby affecting productivity negatively.

4. Empirical Strategy

Our power outage data was self-reported and obtained through interview. Two questions were asked during the survey. First, we asked the frequency of power outage in a typical month. This provided a continuous variable. Second, we asked the average length of power outage, measured in an interval form: less than one hour, 1-2 hours, 2-4 hours, 4-8 hours and more than 8 hours. From this interval, we derived continuous average intensity variables by taking the average of the lowest and highest interval values (0.5 for less than 1h, 1.5 for 1-2h etc.) We calculated the total power outage per month by multiplying the frequency of power outage and average power outage. This was taken as the measure of power outage for this study.

Using this measure of power outage, we were interested in estimating the effect of power outage on enterprises' productivity controlling for enterprise and entrepreneur characteristics. The following regression equation was used to estimate the effect of power outage on enterprises TFP;

$$LnTFP_i = a + b\ln outage + qX_i + pP_i + / C_i + e_i \qquad \textbf{(5)}$$

Where $LnTFP_i$ is the logarithm of enterprises' total factor productivity, which is measured as a residual of regression of output on capital, labor cost, material costs and energy. Further, lnoutageis the lograthism of the total power outage per month, X_i is other enterprise and entrepreneur characteristics. The enterprise characteristics include enterprise size, enterprise age, and whether the enterprise is cooperative or not. Entrepreneur characteristics also include the age of the entrepreneur, his/her years of experience in business, gender, managerial skill, and education. It also includes workers' skill. a , b , p, and $/$ are parameters to be estimated and e is the error term.

Some products may be affected by power outage more than others due to their intensity of electricity consumption. Thus, TFP could be different across product types. We use the fixed effect method to avoid a bias from excluding these effects. We did this by including dummy variables, P representing the product type the enterprise is producing. Because the location of the enterprise could also be expected to create differences in productivity through differences in infrastructure, growth and business climate, we also included the dummy C, representing the city dummies. This also captured the difference in intensity of power outage at the city level.

Since we used a cross-sectional data, there could be methodological challenges to estimate the causal effect of power outage on enterprises' productivity. This is because enterprise specific heterogeneity such as entrepreneurs' negotiation skill might affect both TFP and power outage. Due to lack of exogenous and relevant instruments, we could not control such unobserved enterprise characterizes and our results are correlations, not causations. However, as discussed above, we minimized biases by controlling enterprise and entrepreneur characteristics and also used product and location fixed effects. For example, some enterprises products could be energy intensive making them more vulnerable to electric power outage quotas, affecting TFP and duration of power outage.

As a robustness check we also ran a multinomial switching regression which depends on a relatively a weak instrument. In this case we used the number of plants the enterprise owned as an instrument to power outage in the multinomial switching regression. We used the Stata code selmlog to generate the treatment effect on the treated. From the five interval hours of outage, we generated three discrete values of outage hours. These are less than four hours of outage, between four to eight hours of outage and more than eight hours of outage. We used these as a multinomial discrete variable and the less than four-hours outage is control variable or base category in the switching regression.

In addition to TFP, we also analyzed the effect of power outage on labor productivity measured by output per worker, and also on the firm's annual revenue. We applied empirical strategies similar to the TFP.

5. Descriptive Statistics' Results

In this section, we discuss the results of the descriptive statistics of our measures of power outage and the variables that are included in our regression results. Table 1 presents the average monthly power outage frequency and average length of power outage at national level (all cities) and across the cities. The results show that on average there were about 11 scheduled and unscheduled power outage per month and about 31 hours of power outage per month at a national level.

Table 1: Frequency and intensity of power outage across cities

City	Average outage frequency per month	SD.	Average length of outage per month	SD.
Adama	10.78	4.7	21.75	27.94
Addis Ababa	10.17	12.79	29.38	57.17
Bahir Dar	17.01	16.28	52.61	77.34
Dessie	20.03	17.42	61.22	93.17
Dire Dawa	6.85	4.02	20.98	23.7
Gondar	18.34	24.5	51.3	65.6
Hawassa	9.58	4.2	23.44	25.98
Jigjiga	7.8	3.62	19.24	25.96
Jimma	10	3.83	21.69	20.21
Mekelle	7.98	4.28	22.26	21.42
All cities	10.82	12.55	30.62	54.11

These figures show that Ethiopia is among the worst affected sub-Saharan countries in terms of number and duration of power outages. According to the World Bank Enterprise Survey (2015), Nigeria was the country which had highest levels of power outage (about 24 hours) during a typical month and Togo the lowest with about 5 hours a month. For Ethiopia, the World Bank Enterprise Survey for 2015 was about 20 hours. Our survey covered a larger geographic area and a significantly larger number of enterprises, and our results can be taken as more representative for urban enterprises than the Ethiopian World Bank Enterprise Survey.

Disaggregating the frequency and duration of power outage across the cities covered in the survey, frequency of power outage was highest in Dessie, followed by Gondar and Bahir Dar. As a result, the duration of power outage was significantly higher in these cities. This shows it was indeed necessary to use the location fixed effect regression method in this study.

Table 2a below presents the location of sample firms used in the study. As can be seen from the table, more than 50% of the firms are located in Addis Ababa. This is consistent with overall economic activity of the country. A large proportion of the country’s commercial economic activity takes places in the capital, and as a result there has been disproportionate growth between Addis Ababa and other regional state capitals.

Table 2a: Firm size across sample towns

	Micro	Small	Medium	Total
Adama	140	113	8	261
Addis Ababa	1,195	3035	263	4493
Bahir Dar	314	243	9	566
Dessie	147	86	3	236
Dire Dawa	118	120	6	244
Gondar	211	124	2	337
Hawassa	143	306	10	459
Jigjiga	44	55	5	104
Jimma	148	145	1	294
Mekelle	850	326	4	1180
Total	3310	4553	311	8174

Table 2b presents descriptive statistics of variables used in the main regression. As shown in the table, lograthism of the total factor productivity is significantly greater than zero, which implies that there is larger portion of output explained by other factors (other than labor, capital and material inputs) such as the frequency and duration of power outages. The table shows also average monthly revenue of enterprises is about 131,190 Birr, only about 9% of enterprises use a generator backup source of power during power outages, and about 81% of enterprises are owned by male entrepreneurs, implying male domination in the sector.

Table 2b: Descriptive statistics of regression variables

City	Mean	SD.
Total Factor Productivity (log)	15.32	1.77
Labor productivity (log)	10.73	1.08
Enterprise revenue (level)	131186.90	3208640
Enterprise revenue (log)	12.80	1.41
Generator use (1=yes, 0=no)	0.09	0.27
Power outage (log)	2.66	1.21
Managerial skill(dummy)	0.02	0.14
Workers' skill (dummy)	0.05	0.22
Gender of Entrepreneur	0.81	0.39
Education of Entrepreneur (log)	2.08	0.59
Entrepreneur's years of experience in business (log)	1.7	0.85
Firm age (log)	1.49	0.79
Firm size	1.6	0.55
Cooperative	0.14	0.35
Observations	7844	

6. Econometrics Results

Table 3 presents the Ordinary Least Square (OLS) estimation of the effect of power outage on enterprises' total factor productivity, labor productivity and revenue. The first column of the table represents a regression for the total factor productivity, the second column details labor productivity and the third column is for enterprise.

Beginning our analysis with the effect on TFP, the first column of Table 3 shows the duration of power outage significantly reduced enterprises' total factor productivity. It shows that a one percent increase in the average duration of power outage is associated with 0.54% percent decrease in TFP. Generally, this result implies that power outage serves a negative shock to enterprise productivity by creating a constraint on its production processes. Our result is consistent with previous studies in sub-Saharan African countries and Asia.

Table-3: OLS estimates of power outage on TFP with and without self-generation of power

Variables	ln (TFP)		Ln (Labor productivity)		ln (Revenue)	
	Coef	se	Coef	se	Coef	se
Power outage (log)	-0.54***	0.03	-0.17***	0.01	-0.17***	0.01
Managerial skill	0.36**	0.17	0.13	0.09	0.13	0.09
Worker skill	-0.08	0.12	0.11**	0.05	0.11**	0.05
Age of the entrepreneur (log)	0.44***	0.17	0.23***	0.06	0.23***	0.06
Gender of the entrepreneur	-0.10	0.09	-0.25***	0.03	-0.25***	0.03
Education of the entrepreneur (log)	0.53***	0.11	0.38***	0.04	0.38***	0.04
Experience in business (log)	0.14**	0.06	-0.03	0.02	-0.03	0.02
Firm age (log)	0.04	0.07	0.13***	0.02	0.13***	0.02
Firm size	0.78***	0.07	-0.02	0.03	-0.02	0.03
Cooperative	-0.30***	0.10	-0.38***	0.04	-0.38***	0.04
Production types	YES		YES		YES	
City dummies	YES		YES		YES	
Constant	12.91***	0.70	10.06***	0.24	10.06***	0.24
Observations	1,910		6,760		6,760	
R-squared	0.29		0.17		0.17	

Where ***=significant at 1% level of significance, **= significant at 5% level of significance, *= significant at 10% level of significance and se is robust standard error.

Mensah (2016), using the World Bank Enterprise Survey for 15 sub-Saharan African countries, excluding Ethiopia, found that a one-percent increase in power outage was associated with a 0.6% reduction in firms' productivity. In Pakistan, Grainger and Zhang (2017) also found a negative effect of power outage on a firm's value added, though the magnitude of the effect was relatively lower at about 0.04%.

Tables 3 also shows the effect of power outage on labor productivity and revenue, with a negative effect of power outage on enterprises' labor productivity and revenue. A one-percent increase in power outage is associated with a 0.17%

and 0.19% reduction in labor productivity and enterprise revenue, respectively. Allcott et al. (2014) found that a one-percent increase in power outage results in 0.68% percent reduction in Indian manufacturing firms' revenue. This again implies that power outage limits production processes of enterprises by making some or all of its labor input idle, and reduces production of goods. This affects revenue negatively.

In order to reduce the possibility of omission variable bias, as can be seen from Tables 3, in all the outcome variables, we have controlled certain enterprise and entrepreneur characteristics, location and other variables. Entrepreneur characteristics include an entrepreneur's age, gender, education and experience in business. Enterprise characteristics include the age of the enterprise, enterprise size, whether the enterprise is a cooperative, and sector production type. We also include managerial and workers' skills, measured by language skill. As can be seen from Table 3, most of the above variables are found to be significant determinants of TFP. For example, good managerial skill is associated with at least a 36% increase in TFP, workers' skill is not found to be significant in the TFP regression. However, workers' skills are significant in labor productivity while managerial skills do not provide any significant determinant of labor productivity. In all the tables, age, education of the entrepreneur and age of the enterprise, affects enterprises' TFP, labor productivity, and revenue both positively and significantly.

Although we minimize the bias by controlling enterprise and entrepreneur characteristics, location and other variables, we cannot control the bias that comes from unobserved individual enterprise heterogeneity and measurement errors. To minimize the effect of this, we ran a multinomial endogenous switching regression following Fournier and Gurgand (2005) and Bourguignon et al. (2007). In general, endogenous switching regression is used to control the effect of unobserved individual heterogeneity (Lokshin and Sajaya, 2004). In order to use this method, we generated a discrete variable with three values, taking a value of one if the average one-time power outage was less than 4 hours, two if it was between four to eight hours, and three if the outage lasted more than eight hours. An outage of less than four hours was taken as base category in the switching regression.

Table 4: A Multinomial Switching Regression Result of Average Treatment on Treatment effect of Power Outage on TFP, Labor Productivity and Revenue #

Variables	ATT-TFP (%)		ATT-Labor Productivity (%)		ATT-Revenue (%)	
	Coef	Se	Coef	Se	Coef	Se
Four to eight hours of power outage	-11.1***	0.02	-5.6***	0.01	-5.8***	0.03
More than eight hours of power outage	-12.0***	0.02	-6.6***	0.02	-6.9***	0.04
Observations	1,958		6,880		6,880	

Where #= the control is enterprises which face less than an hour outage, ***=significant at 1% level of significance, **= significant at 5% level of significance, *= significant at 10% level of significance; and Se is robust standard error.

Table 4 shows the multinomial endogenous switching regression effect of the three power outage intervals on TFP, labor productivity and revenue. It indicates that outage of four to eight hours is related to 11%, 5.6% and 5.8% lost in TFP, labor productivity and revenue, respectively, compared to outage of less than four hours. The loss in TFP, labor productivity and revenue increases by about one percentage point if the power outage is more than eight hours. The negative and significant switching results show the robustness of our OLS results. Furthermore, comparing the magnitude of the switching results with the above OLS results, it seems that the switching regression results are higher. The OLS results, however, are for a one percent change in power outage while the switching results are for longer outages. These switching results also show the robustness of our results.

7. Conclusions

The difference in the quality of infrastructure among rich and poor countries is one of the determinant factors for the large productivity gap among their production enterprises (plants) and one such infrastructural factor is the electricity supply. Electricity supply in many low-income countries is characterized by frequent scheduled and unscheduled interruptions. Frequent and lengthy power interruptions encourage enterprises to incur additional investments on diesel generators. If enterprises have no other source of electric power generation, specifically for unscheduled interruptions, either they are forced to shut down or send some workers home. Both have an effect on a firms' production activities.

Despite the Ethiopian government's huge investment in the power sector over the last decade, power outage in the country remains one of the top constraining factors for enterprise production activity. According to our survey, in a typical month, on average total power outage amounts to about 30 hours, and this is of frequent occurrence. Ethiopia is one of the most affected sub-Saharan countries in a typical month.

Although there is growing empirical evidence of the impact of power outage on firms' productivity in developing countries, the evidence from Africa is thin and qualitative/descriptive in nature. We found no empirical study for Ethiopia. In this study, we therefore purposely collected primary data in 2017 from 8174 micro and small-scale manufacturing enterprises operating in Addis Ababa and nine other major regional towns to study the effect of power outage on total factor productivity, labor productivity and enterprise revenue.

Due to cross-section nature of our data and the lack of exogenous and relevant instruments, we used an ordinary least square method of estimation and hence our results are interpreted as correlations. In order minimize omitted variable bias, we controlled a set of enterprise and entrepreneur characteristics. We also used product and location fixed effects. Using this method, we found a one percent increase in the average duration of power outage is associated with 0.54%, 0.17%, and 0.19%, decreases in TFP, labor productivity and revenue, respectively. Our result is consistent with previous studies in sub-Saharan countries and Asia. Generally, this result implies that power outage serves as a negative shock to productivity and revenue by creating constraint on production processes.

Our results imply that in order to improve productivity and the overall performance of enterprises, providing sustainable and reliable electricity should be a top priority. This has implications for the country's second Growth and Transformation Plan, which aspires to transform the country's agriculturally dominated economy into an industrial economy. Without a reliable supply of electricity, this will be difficult, if not impossible, to achieve.

As we noted above, however, we are relying on a cross-sectional data to analyze outcome variables and we did not find a sound instrument for the endogeneity power generations. The results should therefore be interpreted as a correlation rather than causation. Further, due to data limitation, we only considered micro and small enterprises and our results may not apply to larger-scale manufacturing enterprises. Future research is necessary to address these limitations using panel data and a valid instrument.

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