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Working Paper: Study on the impact of electricity tariff increases on enterprises' electricity consumption and response in Ethiopia

This study focuses on analysing how electricity tariff increase affects small and micro enterprises' energy consumption by considering the price change in the context of the broader electricity service provision in Addis Ababa, Ethiopia.

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Study on the impact of electricity tariff increases on small and micro enterprises electricity consumption and response in Ethiopia

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Abstract

The electricity tariff rate in Ethiopia was among the lowest in Africa. This affected the financial viability of the utility and the quality of services provided to its customers. In order to address these challenges, the government introduced an electricity tariff reform for all types of consumer categories in December 2018 which was implemented every year until December 2021. However, the effect of this reform on micro and small enterprises, which are the largest source of employment in the country, has not been well studied. This study attempts to fill this gap using qualitative data collected from micro and small enterprises in Addis Ababa. The study finds that depending on where they are located MSEs face numerous challenges related to cost and poor service provision unevenly. Enterprises located inside clusters, industry zones administrated by the city administration, are better informed about energy efficiency measures and face fewer power disruption. On the other hand, firms located outside the cluster are negatively affected by unreliable and poor service provision and the increasing cost of electricity. For firms in the latter group this also has additional financial implications including the cost of alternative energy supplies, damage to raw materials and loss of business opportunities. Therefore, the study suggests that these interrelated issues cannot be addressed by revising tariff rates alone but require multiple interventions.

Key words: micro and small enterprises, electricity tariff, impact, Addis Ababa

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1. Introduction

Small and Micro Enterprises (SMEs) are considered as priority sectors in Ethiopia since they absorb the majority of urban employment. Beyond employment creation, SMEs are also thought to help to create an enabling environment for industrial expansion, in line with the country's long term plan of achieving an industry-led economy(Ageba and Amha, 2006; UNDP, 2017). Although enterprises' operation in Ethiopia have a long history, most enterprises were established following the formulation of a SME strategy in 1997, which was accompanied by the establishment of the Federal Micro and Small Enterprises Development Agency (FeMSEDA)[1] in 1998. After the formulation of the SME development strategy, various types of support have been introduced to these enterprises in view of the national development goals.

The support to SMEs has mainly followed a cluster-based approach. Cluster refers to agglomeration of related enterprises in a particular geographic location (UNIDO, 2010). In Ethiopia, clusters could be either natural or government created. The former refers to a concentration of firms that gradually emerged due to market forces, while the latter are clusters created through government provision of working and selling premises and infrastructure to enterprises in selected priority sub-sectors of the manufacturing sector that are considered to have growth potential. Enterprises operating inside government-created clusters get access to various support packages including business development services and links to markets[2] (Ali, Godart, and Seric, 2016). Enterprises outside of government created clusters, including those dispersed in residential areas, are also eligible for some of the packages like business development service.

However, in spite of various support schemes, SME sector growth in Ethiopia has been below expectation, with many firms dropping out in the first few years of operation (Woldehanna, Amha, and Yonis, 2018). Such challenges are attributed to internal and external factors including shortage of capital, uncertainty of market, inadequate working premises, limited access to finance and inadequate provision of infrastructure for production, including electricity (Ageba and Amha, 2006; Ahmed and Ahmed, 2021). Studies on enterprises in Ethiopia indicate that frequent power outages and inadequate electricity provision were among the impeding factors for growth and expansion (Ambachew et al., 2018; UNDP, 2017).

The electricity tariff reform was implemented against this backdrop. In Ethiopia, electricity has been highly subsidized and the tariff rate remained the lowest in sub-Saharan Africa until 2018. In 2018, the Government introduced a reform of the existing tariff rate and structure to improve cost recovery, investment in electricity generation and service provision. The tariff change was gradually implemented in four consecutive years starting from 2018. The changes in electricity tariff rate and structure are expected to have impact both on the supply and demand side of the electricity market in the country. On the demand side, for

[1] FeMSEDA was first established in 1998 as "Micro and Small Enterprise Development Agency" with a duty to oversee institutions that provide support to SME in line with the SME strategy formulated a year earlier (Ambachew et al,. 2018). The agency was renamed later in a 2004 amendment. The SME strategy was revised in 2011 with more ambitious target including industrial development, job creation and equitable distribution of income and wealth. And the FeMSEDA was re-established with a new regulation (Fedral Democratic Republic of Ethiopia, 1998).

[2] Although government created clusters help alleviate working premise problems, they usually fail to create the anticipated benefits of clustering like cooperation and linkage compared to natural clusters(Ali et al., 2016).

instance, firms' decisions concerning their day-to-day operation could be influenced by the changes in the cost of electricity as well as improvements in service provision. In the literature, increase in electricity price is associated with various responses by firms including a reduction in electricity consumption and the imposition of limits on the use machinery, with a shift to more labour-intensive approaches instead. Those responses by firms usually lead to a decline in labour productivity and output (Jain and Nandan, 2020; Tesfamichael et al., 2021).

From the utilities' perspective, an increase in electricity tariff may not always translate into higher cost recovery due to various factors including rising input costs (Briceño-Garmendia and Shkaratan, 2011), poor governance and service delivery (Tesfamichael et al., 2021), non-payment, and inefficient billing systems (Klug et al., 2022). For instance, studies show that although electricity tariffs in Sub-Saharan African(SSA) countries increased substantially between 2001 and 2005, they were not able to keep pace with the rising costs (Briceño-Garmendia and Shkaratan, 2011). In addition, the cost-recovery impact of tariff reform also depends on how electricity consumers, including enterprises and households, respond to the price hike. While evidences suggest that electricity consumers in SSA are insensitive to electricity tariff changes (Klug et al., 2022), enterprises could however respond in a number of ways, for example, by reducing electricity consumption, passing on increased costs to their customers (which may depress demand for their products) or even resorting to illicit connections to the grid to avoid the tariff change. All of these responses have the potential to negate potential net revenue increases to the utility from the tariff change. Finally, there is a possibility of a vicious circle whereby an increased tariff does result in revenue and improvement in the financial viability of the utility. If the additional revenue is, in turn, used to improve the electricity service provision, then enterprises' performance, which is currently challenged by power outages and unreliable electricity services (Falentina and Resosudarmo, 2019; Hassen and Degu, 2019), would potentially be improved.

The objective of this paper is to analyse the socioeconomic and technical drivers influencing the energy decisions of SMEs in Addis Ababa. The study takes an integrative approach to capturing and examining the effect of business practices, the infrastructure of production including electricity, and external influences such as the Covid-19 outbreak, access to finance, an increase in cost of inputs, and security concerns.

In the subsequent sections of this paper, findings from the study will be discussed. Section two discusses the research methodology. Section three outlines the context of research followed by Section 4 which discusses the findings of the study including discussions on the impact of tariff reform on SMEs, the cost of service provision from SMEs' perspectives, and finally SMEs' coping strategy and capacity. Section 5 discusses the conclusion and recommendations.

2. Research design and methodology

Approach: The empirical study from which this report draws from was carried out the research in June and July 2021, three years after the first round of tariff increase was introduced. The research team carried out a qualitative research targeting SMEs that are based in Addis Ababa. Data collection followed three methods: document reviews, focus group discussions (FGDs) and key informants' interviews (KIIs). Firms selection followed the national definition of micro and small enterprises, which categorises firms with up to five employees as 'micro enterprises' and firms up to 30 employees as 'small enterprises'(Ambachew et al., 2018). In Addis Ababa, most SMEs in the manufacturing sector operate inside clusters provided by the city administration.

As a part of support for growth oriented enterprises[3], the city administration provides working premise and other supports for firms inside clusters. The clusters are mainly found in four sub-cities: *Yeka*, *Addis Ketema*, *Akaki Kality* and *Lafto*. The team conducted a total of four FGDs, one in each of the four clusters. Selection of FGD participants was based on a bigger enterprise survey for a project that was conducted under the Applied Research Programme for Energy and Economic Growth.

Participants were drawn to represent the geographic and market diversities and other factors such as ownership, size, operational capacity and years of operations into account. However, within the manufacturing sector women are underrepresented. This also meant within the premises of the clusters women owned MSEs are very few(Ambachew et al., 2018). Thus, to be able to explore the gender dimension of firms' electricity consumption, as well as how they were affected by Covid-19, we conducted 10 KIIs targeting women-owned firms outside government created clusters. Those firms are located in residential and commercial areas. KII participants were selected based on a bigger enterprise survey that was conducted by Policy Studies Institute (PSI) in 2016/17[4]. Furthermore, three experts from Ethiopian Electricity Utility (EEU) were interviewed to understand the utility's perspective on the drivers of the tariff change and its impact on revenue and service provision. The experts were selected from energy management and customer service departments of the utility. Interviews were then transcribed and coded for analysis.

Characteristics of participant firms: Although small enterprises operated in Ethiopia for a long time, most of the currently operational enterprises started operation following the establishment of the Micro and Small Enterprises Development Agency. Almost all enterprises participating in this research were established between 2005 and 2016. The average age of participant firms was close to 6 years. In terms of subsectors, 53 percent of participants were owners of metal working workshops and produce various metal products including components of windows, doors, home appliances and construction materials. Most enterprises in this subsector are located inside government created clusters. The second most common enterprises were food and beverage enterprises which engaged in various activities including small-scale edible oil production, and *injera* and bread baking. The latter enterprises were predominantly owned by women and typically located outside clusters. The third group of enterprises were from the furniture and woodwork sub-sector which produces sofa, chairs, tables and other furniture products. Like metal workshops, participants from this sub-sector were also located inside government created clusters. A few other enterprises from textile and garment subsectors, located outside clusters, were also included. In terms of forms of ownership, participants were chosen from a mix of sole proprietors and partnerships. In the latter case, the number of owners ranges between 1 and 9. About 68 percent of the participants were from industry zones/clusters. The remaining participants were from home commercial and non-commercial areas. Enterprises are usually accepted to government created clusters by sub-city officials based on certain criteria (e.g. growth orientation). The working premises in clusters or industry zones are provided at a rent that is cheaper than

[3] Growth-oriented enterprises are enterprises with a potential to drive productivity and employment, and facilitate transition to industry-led economy. Generally, firms in manufacturing sub-sector are considered as growth-oriented in Ethiopia. Growth oriented sub-sectors are selected sub-sectors which are expected to contribute significantly towards the planned industry-led economy of the country. Those firms are prioritized in many support schemes provided by the government.

[4] The 2016/17 survey conducted by PSI served as a baseline for the quantitative firm survey conducted under the Applied Research Programme for Energy and Economic Growth (EEG) as well as selection of key informants for women-owned firms that were not included in the firm survey under EEG.

other commercial areas. Enterprises in those clusters or zones are also easily accessible and likely to get more business development support from government and other entities.

3. Research context: SMEs and the electricity sector reform

The role of SMEs in the economy: With more than 100 million inhabitants, Ethiopia is the second most populous country in Africa. Although the country is predominantly inhabited by rural residents, both the urban population and the urban labour force are growing at a fast rate (Ketema and Diriba, 2021). With the growth in the urban labour force, SMEs are considered as the main potential avenues for urban employment creation, transition to an industry-led economy, poverty reduction and welfare (Ageba and Amha, 2006; Ambachew et al., 2018). SMEs have been particularly important for low-income urban residents due to the small capital requirement and labour intensity (Ageba and Amha, 2006). Consequently, the sector has been highlighted in policy dialogues in Ethiopia.

The successive development plans and sectoral strategies of the country since 1997 gave due emphasis to SMEs and their role in urban employment and structural transformation. As a result, SMEs have been prioritized for various support schemes by government and non-government actors. The government made various efforts to provide business development services including entrepreneurship training, kaizen[5] training, technical skills training, provision of market linkages and working premises. Following the growing interest in SMEs at the national level, many small firms were established.

SMEs are unevenly distributed among subsectors with furniture and wood work, food and beverage, and metal works together accounting for about 63 percent of the total establishments. On the other hand, textile and garment establishments account for only 9 percent. In terms of geographic distribution, SMEs show a clear geographic variation with Addis Ababa hosting more than half of the enterprise (Ambachew et al., 2018).

Growth prospects and challenges of the sector: Studies indicate that the SME sector has the potential to contribute to broad-based economic growth, reducing unemployment and poverty as well as supporting other macroeconomic outcomes (Ambachew et al., 2018; Endris and Kassegn, 2022; Engida et al., 2017). However, the SME growth has also been challenged by internal and external factors including shortage of capital, uncertainty of market, power interruption, inadequate working premises and limited access to finance (Ageba and Amha, 2006; Briceño-Garmendia and Shkaratan, 2011; Falentina and Resosudarmo, 2019; Klug et al., 2022) .

Our FGD results reveal that there are noticeable heterogeneities in terms of growth and evolution of the SME sector and participant enterprises. First, considering firms by subsector, subsectors that are identified by government to have strong growth

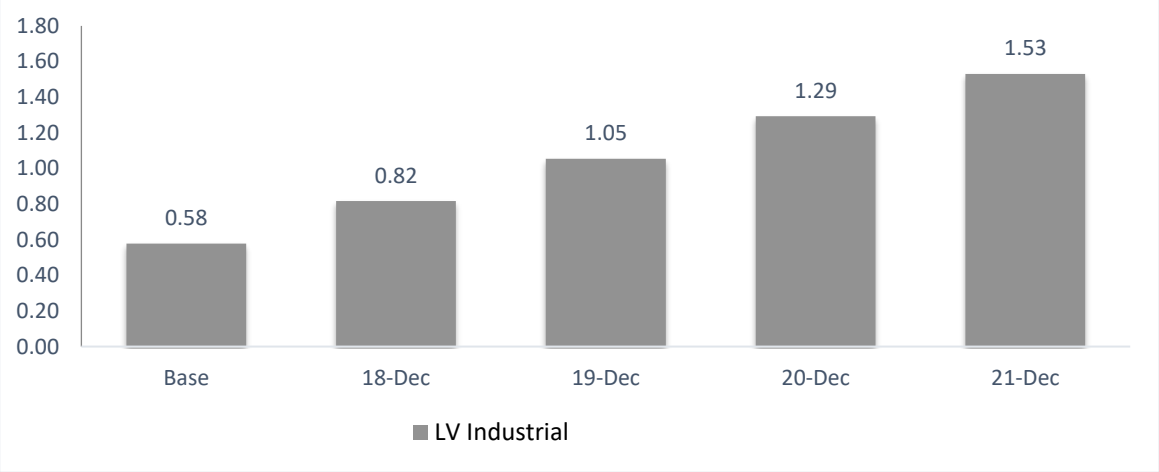
[5] Kaizen is a Japanese concept of continuous improvement in any business activity including manufacturing and engineering(Kiran, 2020). Kaizen has been implemented in several countries, and studies indicate that its implementation improved profitability of small firms(Mano et al., 2014). In Ethiopia, Kaizen training is one of the business development supports provided by the government for firms. The Ethiopian Kaizen Institute is responsible for conducting the Kaizen programs in Ethiopia(Shkabatur, Bar-el, and Schwartz, 2021)

potential[6] usually get more support from government. Those firms mostly operate inside government created clusters. FGD participants from the growth-oriented firms appear to have mixed perspectives on the growth of the SME sector in general and their sub-sector in particular. Several of the participants indicated that there had been positive growth in terms of the number of enterprises, number of jobs they create, sales and income until the outbreak of Covid-19. Yet, many participants reported that the growth of SMEs has been below expectations. On the other hand, KII participants from predominantly women owned firms indicate that their businesses were not growing even before covid-19 outbreak.

The electricity Tariff reform: Historically, electricity tariff changes in Ethiopia were infrequent. In 2006, the electricity utility implemented a tariff reform which increased the average tariff per kWh from $ 0.0376 to $0.06 and removed the existing cross-subsidy to domestic customers. Since then, the tariff rate remained unchanged until 2018. In December 2018, the government introduced a new tariff reform aimed at improving the financial health of the utility. The reform was implemented in four rounds until December 2021. KII participants from EEU indicate that the tariff rate before 2018 was far below cost recovery level and very low compared to neighbouring countries. The main objective of the reform was to make the tariff rates cost-reflective. Apart from improving cost recovery, the tariff reform was also expected to encourage private sector participation in electricity generation and expansion of electricity access (EEP and EEU, 2017).

Manufacturing SMEs fall under the low voltage industrial tariff category. Before the reform, customers in this category used to pay a flat rate of ETB 0.578 per kWh. In the first round of the tariff change that was implemented in December 2018, the average tariff per kWh increased by 41 percent. In the subsequent rounds, the tariff increased by 29.2 percent, 22.6 percent and 18.4 percent, respectively, compared to each preceding year (EEP and EEU, 2017). In addition to the tariff rate per kWh, the reform also introduced a change in structure. According to key informants, demand charges were introduced to low and medium voltage industrial customers.

Figure 1: Electricity tariff for low voltage industrial customers in ETB per kWh



Source: EEU

6Growth oriented sub-sectors are selected sub-sectors which are expected to contribute significantly towards the planned industry-led economy of the country. Those firms are prioritized in many support schemes provided by the government.

4. Findings and discussion: Electricity tariff reform, service provision and firms' response

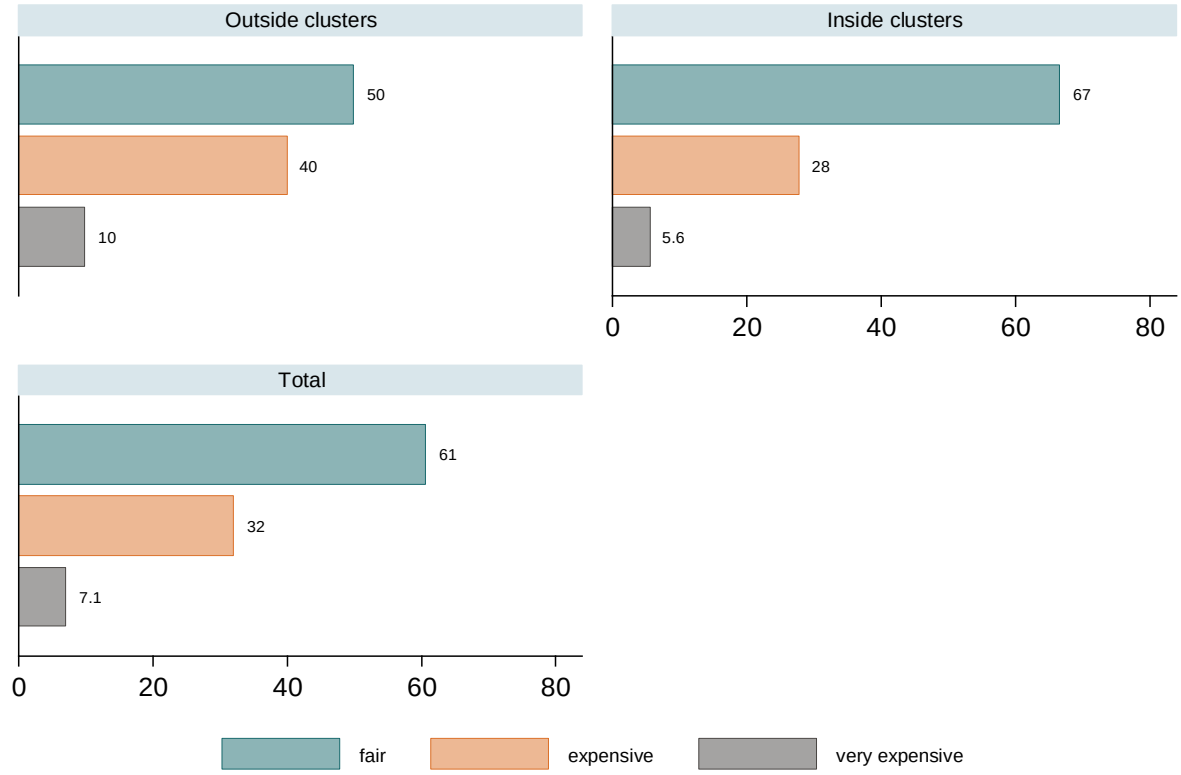
4.1 Electricity tariff change:

The response of firms to the increase in electricity costs needs to be understood within the context of inadequate electricity supplies and the lack of viable alternatives to the utility for sourcing power (Tesfamichael et al., 2021). SMEs in Addis Ababa entirely depend on electricity from the utility for production since most of them cannot afford to have alternative power sources such as a diesel generator. In addition, the covid-19 outbreak, that coincided with the tariff reform, significantly affected both electricity service provision and firms' operations in Addis Ababa (Girum, Bundervoet, and Wieser, 2020).

Before the tariff change was implemented, the utility provided information to its customers about the tariff change using various media outlets. Our results from FGDs and KIIs corroborate this. The majority (87.5%) of participant enterprises reported that they were aware of the changes in the tariff rate and structure as well. However, the cost of the tariff change is felt unevenly among enterprises. Several enterprises appear to be more resilient to the price change. In total, about 60 percent of both the FGD and KII participants think that the electricity tariff after the reform was affordable. Perceptions about the price also vary depending on whether firms are located inside government created clusters or not (see Figure 2). On the other hand, FGD participants were concerned that the increased tariff increases their cost of production, forcing them to raise prices which, in turn makes it difficult to sell their products at an affordable price. Most forms operating outside of clusters also reported that energy cost is a big concern for them.

Such differences in perception and resilience to the tariff change could be understood in terms of the differences in access to information about energy management options. Firms inside government created clusters have better access to information and follow-up on energy conservation options since they can easily be accessed by the utility, experts from Ethiopian Energy Agency (EEA) and agents from the enterprise development offices of sub-cities. Clusters also simplify information sharing between firms. Not surprisingly, 16 participants operating inside clusters report that they got access to information about electricity conservation measures compared to only 1 participant outside of the clusters. They indicated that the main sources of such information were the EEU/EEA, the media, friends and neighbours.

Figure 2: Perception about affordability of electricity tariff



However, while the direct cost associated with the tariff rate remains important, almost all enterprises are at least equally concerned about the reliability of the service and customer service provisions. Both FGD participants and KIIs usually stress costs related to the power outage and customer service related issues like billing errors, failure to read meters on a monthly basis, and the resulting accumulations of arears.

From the utility's perspective, the tariff change was aimed at improvement in its financial position. Drawing on the KII with experts from the utility, the tariff revision, coupled with other measures to reduce losses, was indeed followed by an improvement in its financial position. Given the limited alternative viable supply options, there was no noticeable decline in electricity demand following the tariff change. The utility was in a severe financial situation before the tariff change, as a result of which importing good quality inputs necessary for maintenance and other services was a significant challenge. The company was highly subsidized by the government in order to continue its operations. The tariff reform has reduced the budget support needed from the government. The utility indicates that increased revenue is being used to improve the quality of service provision. However, key informants stress that such investments need time and problems related to electricity service provision issues will only be solved gradually.

Our KII with experts from the utility also indicate that there were complaints related with the tariff change from enterprises, especially after the third round tariff change. Most enterprises were also critical of the newly introduced demand charge. In addition, according to experts from EEU's energy management department, electricity pilferage has increased especially among

general tariff category[7]. Overall, the cost of electricity service cannot be separately understood without accounting for the various internal and external electricity service related factors, which are discussed in the next section.

4.2 The context of poor electricity reliability and service provision

Unreliable electricity supply affect firms' costs, choice of technologies, competitiveness and product quality. In Ethiopia, power outages are found to increase production costs by up to 15 percent (Abdisa 2018). Power outage problems are mainly caused by limited electricity generation, technical failures related with the power distribution or transmission systems and limited system capacity relative to increasing demand (Hassen and Degu, 2019; Meles et al., 2021; Tesfamichael et al., 2021).

Almost all participants in this research indicated that their businesses' performance has been affected by power outages and voltage fluctuation. Most participants reported that they are dismayed because they didn't observe improvements in quality of the service even after the increase in the tariff rate. Frequent unplanned power outages continued. Unlike the planned rolling blackouts that are implemented by the utility to ration power during shortages of supply, most incidences of power outage happen suddenly and without any prior notice. The unpredictability of such blackouts makes it difficult for firms to make preparations and reduce the associated costs. Although some participants report improvements compared to the last couple of years, power outage is still a critical problem for SMEs. In some of the areas, it takes up to several weeks or even a month until power outages are resolved. From our interviews, we observed noticeable differences both in terms of frequency and duration of power outages outside of and inside government created clusters, with firms outside those clusters facing more outages.

Firms endure various costs due to frequent power outages. Participants from electricity-intensive manufacturing sub-sectors are usually entirely dependent on electricity for their operation. With a handful exceptions, SMEs cannot afford to buy backup generators. Prolonged power interruptions can result in long delays to delivery of customers' orders, which can in turn lead to loss of future customers. Unreliable power also increases the cost of production. With backup options absent, enterprises use other coping mechanisms such as compensating through extended work hours when power is available.

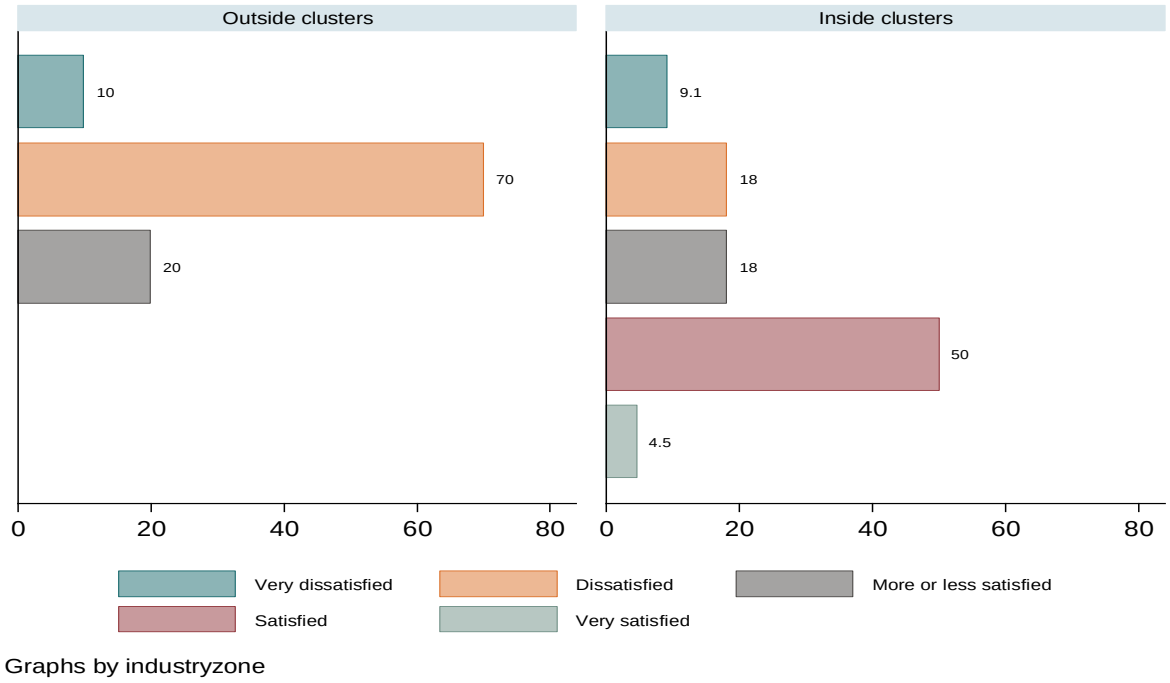
The other concern related to electricity service is inadequate customer services. Enterprises mainly raise their concerns on how the utility manages maintenance, billing and meter reading issues. Participants indicated that billing and meter reading services are often delayed. Tasks as simple as recharging their prepaid meter can take hours or sometimes days. They usually spend significant amount of time waiting to get service. Customers sometimes pay money to circumvent waiting for long time.

Aging transmission and distribution networks contribute to power outages. As already noted above, the utility was usually unable to maintain the distribution infrastructure on time due to financial constraints. And this increased cases of power interruption due to failures in the distribution system. In the event of such breakdown, participants report multiple cases in which the utility is unresponsive to their request for maintenance.

[7] Injera baking enterprises fall under this tariff category

Finally, participants were also asked about their overall satisfaction level with the electricity service from the utility. The responses were more or less equally distributed between 'satisfied' and 'dissatisfied'. However, a clear pattern of response is observed between whether the firms are located inside clusters/industry zones or not. More than half of the participants from the cluster groups appear to be satisfied with the electricity services. However, firms outside the clusters, which are located either in commercial or residential areas, seems to be skewed towards 'dissatisfied'.

Figure 3: Satisfaction of firms with electricity service



Source: Authors' computation from survey

4.3 Firms' responses to electricity cost and inadequate services

Firms take various energy conservation measures to reduce the cost associated with their electricity consumption. The most common practice among all enterprises is turning off lights (Ambachew et al., 2018). We observed a noticeable difference across location of firms in the other measures. Regularly cleaning machines and compressors is the most common practice of improving machines' energy efficiency among participants. Firms inside clusters apply more energy saving gadgets and conservation measures. Several participants from clusters report that they replace their old machines and compressors with energy efficient options (40.9 percent) and use energy star rated appliances (22.7 percent). On the other hand, firms outside clusters use energy efficient light bulbs, translucent roof and opening of windows to keep their electricity consumption down. It should however be noted that firms inside clusters have more machineries, giving them the opportunity to apply more energy conservation measures.

Enterprises also take various measures to cope with power outages and voltage fluctuation. For example, FGD participants explained that to avoid delays related to power outages, they convince their employees to work on the weekends. In return, they are expected to pay double the normal workday salary. Another reported coping mechanism is working in multiple shifts so that

in the event of power interruption in one shift, the business will still operate in the other shifts and production will continue smoothly. Some firms also hire dedicated employees to work during night time in addition to the already existing daytime workers if an urgent customer order is affected by power interruption.

Depending on the nature of their product and specific contexts, firms have various ways of dealing with unreliable supply that are peculiar to them. For instance, FGD participants from the furniture and woodwork subsectors have manual options for some of the activities like sawing and cutting. During power outages, they work on activities that do not necessarily require electricity and save assembly and other power intensive activities for later. Firms in the metal work subsector usually do power consuming activities like welding during the night time to avoid voltage reduction. On the other hand, firms in food and beverage subsector resort to alternative low-grade fuels to maintain production amidst frequent power blackouts and brownouts. A bakery owner explained her experience as 'There are times when we had to wait for a week until the maintenance issues are fixed'. During those times we have to rely on fuelwood for our business. As a backup for electricity blackouts, we installed an oven that works with fuel wood and which cost about 20,000 ETB.'

Table 1: Energy conservation measures

Energy conservation measures	Location		Total%
	Outside clusters %	Inside clusters %	
Use energy efficient light bulb	30	95.5	75
Clean Machinery and compressor	0	77.3	53.1
Replace machines and compressors	0	40.9	28.1
Use Translucent roof	60	27.3	37.5
Change working hours	0	18.2	12.5
Using energy star appliance	0	22.7	15.6
Opening windows to save ventilation cost	70	4.5	25

Source: authors' computation from survey

On the other hand, although many SMEs operating inside clusters take the energy conservation measures recommended by EEA, most of the enterprises do not have the habit of recording their electricity expense, letting alone analysing and using it for decision making in energy management. In addition, none of the participants consider energy saving potential when they purchase appliances. Firms purchase various electricity using appliances. In doing so, they take various issues into account but mainly focus on capacity, durability and cost. In addition, they check whether the appliance voltage fits with their regulator system. However, energy saving does not feature as a consideration.

4.4. Impact of Covid-19

After 2019, SMEs in the study area were challenged by various external conditions including access to finance, the Covid-19 outbreak, shifts in consumer preferences towards imported goods, an increase in cost of inputs and security concerns. Although, some of the challenges like access to finance persisted for a long time, the Covid-19 outbreak aggravated them. FGD participants indicated that the rising input costs have had numerous impacts on their businesses. An increase in cost of raw materials hampered expansion of their enterprises, and resulted in decline in the demand for their products. Due to the increase in prices of the product that follows the increase in input costs prices for goods produced by SMEs increased. This makes the price of goods produced by SMEs comparable to better quality products that are imported from abroad. Consequently, customers started to shift their preferences to imported substitutes.

Covid-19 severely affected smaller firms since they had limited avenues for navigating through the pandemic (Adian et al., 2020). On the supply side, the quarantine of workers and the disruption of the supply of inputs resulted in sub-optimal capacity utilization. On the demand side, the sudden loss of demand and sales due to consumers' uncertainty, decline in income and fear of contagion resulted in severe liquidity shortages. The labour intensiveness of the sector meant SMEs were strongly affected by social distancing and quarantine associated with covid-19 (Zeidy, 2020). This, combined with limited access to finance, left them vulnerable to the pandemic. Our results from FGD and KII indicate that participant enterprises were adversely affected by the COVID-19 outbreak, with many closing during the first couple of months after the first case was identified in the country. Enterprises in the food and beverage sub-sector continued operation during the pandemic, but at a reduced capacity.

Participants from both the enterprises and the utility were asked if electricity services were affected by the Covid-19. Many enterprises that continued operation during the pandemic indicate that the Covid-19 outbreak worsened the already poor electricity service provision, especially in the first month of the outbreak. The power outages and voltage fluctuations increased both in terms of frequency and duration, and maintenance related power outages took longer to get restored by the utility. KII results from EEU on the other hand indicate that the utility sustained the usual services for the existing customers during the pandemic although it meant increased costs of operation like provision of adequate protection for its field staff. The field staff continue working in shifts to provide adequate maintenance services when needed. But, the utility reduced the number of staff that go to office to the minimum possible while most of the office staff stayed at home. This measure created delays in many customer services including new subscription and resolving customer complaints. Social distancing affected the revenue of the utility in two additional ways. First, due to social distancing measures, meter reading for post-paid meter customers was mostly delayed which slowed down collection of receivables. The utility then had to rely on estimation based on customers' electricity consumption history to issue bills. Second, temporary closure of most enterprises including SMEs during the first couple of months of the pandemic meant a decline in revenue of the utility that was collected from enterprises.

5. Conclusion

Electricity had been highly subsidized in Ethiopia until 2018. The average tariff rate of $0.06 was among the lowest in Africa. This affected the financial viability of the utility and negatively affected the quality of services provided to its customers. To ensure cost recovery and better service provision, the government introduced a tariff reform for all consumer categories in 2018. The tariff reform includes the tariff rate for SMEs, the focus of the current study, which fall under low voltage industrial (LV) customers' category.

Although it has been more than four years since the implementation of the first round tariff reform, its effect on SMEs and their coping mechanisms have not been studied. This study attempts to identify and analyse the socioeconomic and technical factors influencing the energy decisions of SMEs in Addis Ababa. The study takes an integrative approach to capture and examine the effect of business practices, infrastructure of production including electricity and external influences. In addition, the timing of our study which coincides with the Covid-19 pandemic lends us the opportunity to explore how Covid-19 together with other infrastructure and market related stressors shape small business operation in the city. The study uses qualitative data collected from SMEs in Addis Ababa using FGD, KII and semi-structured interviews.

Based on our study, we observed that SMEs face complex challenges related with both electricity cost and electricity service provision. First, the effect of tariff increase is felt unevenly. The major finding is that those firms inside clusters are better informed and less concerned about cost, compare to firms located outside. Firms located in government financed clusters usually have easy access to information related to energy conservation. Another interesting finding is that reliability of service provision is more of a concern than cost. Cost remains to be an issue but not as disruptive as poor service provision. Second, the issue of unreliability is not equally felt across all sectors and groups – some were more affected than others. Unlike firms located outside the clusters, those firms working within clusters are relatively better protected from the unreliable electricity supply. Furthermore, unreliable service has a significant cost implication – say, compared to the households – because of the cost of bringing alternative resources, the impact on efficiency of labour use, loss of business opportunities, damage to raw materials, etc. In relation to this, lack of information and poor service provision creates an institutional distrust (e.g. meter reading) that could potentially have a long term effect on future energy conservation and public awareness efforts.

In sum, we find interrelated issues that requires multiple interventions. First opportunities available to those in cluster must be available to those outside. Second, improving reliability of service would remove the additional cost that is now diverted away from efficiency. Faced with reliability and power quality issues, energy efficiency is not going to be a high priority for SMEs who are often budget constrained. Hence, mitigation costs and other measures will divert resources from any potential investment that can be made towards improving energy efficiency.

Overall, efforts to improve efficiency need to consider both the supply and demand side issues at once and operate in sync. Inadequate supply and poor supply-side management play an important role in hindering SMEs' uptake of energy efficiency and conservation options.

References

Abdissa, L,T. 2018. "Power Outages, Economic Cost, and Firm Performance: Evidence from Ethiopia." *Utilities Policy* 53(June):111–20. doi: 10.1016/j.jup.2018.06.009

Adian, I., Doumbia, D., Gregory, N., Ragoussis, A., Reddy, A., & Timmis, J. (2020). Small and Medium Enterprises in the Pandemic: Impact, Responses and the Role of Development Finance. In Policy Research Working Paper 9414. https://doi.org/10.1596/1813-9450-9414

Ageba. G, and Amha, W. 2006. "Micro and Small Enterprises (MSE) Development in Ethiopia: Strategy, Regulatory Changes and Remaining Constraints." *Micro and Small Enterprises (MSE) Development in Ethiopia: Strategy, Regulatory Changes and Remaining Constraints* 10(2):103–103.

Ahmed, H.M.S., and Ahmed, Y.A. 2021. "Constraints of Youth Entrepreneurs in Ethiopia." *Journal of Global Entrepreneurship Research*. doi: 10.1007/s40497-021-00292-z.

Ali, M., Godart, O., Görg, H., and Seric, A.2016. "Cluster Development Programs in Ethiopia: Evidence and Policy Implications," Kiel Institute for the World Economy.

Ambachew, A., Getahun, T., Assefa, B., Abebe, G., Hassen, S.H., Medhin, H., and Gebreeyesus, M. 2018. *Main Features of Micro and Small Manufacturing Enterprises in Ethiopia. Addis Ababa: Ethiopian Development Research Institute*.

Briceño-Garmendia, C., and Shkaratan, M. 2011. "Power Tariffs: Caught between Cost Recovery and Affordability." (December):62.

Bundervoet, T., Abebe, G., and Wieser, C. 2020. "Monitoring COVID-19 Impacts on Firms in Ethiopia Results from a High-Frequency Phone Survey of Firms." 876(August 17):876.

Endris, E.,and Kassegn, A. 2022. "The Role of Micro, Small and Medium Enterprises (MSMEs) to the Sustainable Development of Sub-Saharan Africa and Its Challenges: A Systematic Review of Evidence from Ethiopia." *Journal of Innovation and Entrepreneurship* 11(1). doi: 10.1186/s13731-022-00221-8.

EEP and EEU. 2017. *Electricity Generation , Transmission and End- User Tariff Design*.

Engida, E., Regassa, M., Worku, I.H., FYimer, F., and Yifredew, S. 2017. "Rsite Laval The Role of Micro and Small Scale Enterprises in the Ethiopian Economy, Government Intervention and Alternative Strategies: A CGE Analysis." *PEP Working Paper 2017-18*.

Federal Democratic Republic of Ethiopia (FDRE). 2011. "Federal Micro and Small Enterprises Development Agency Establishment Council of Ministers Regulation." *Federal Negarit Gazette* (201):5766–70.

Falentina, A. T., and Resosudarmo, B.P. 2019. "The Impact of Blackouts on the Performance of Micro and Small Enterprises: Evidence from Indonesia." *World Development* 124:104635. doi: 10.1016/j.worlddev.2019.104635.

Fedral Democratic republic of Ethiopia. 1998. "Councel of Ministers Regulations No. 33/1998 to Provide For The Establishment of The Micro and Small Enterprize Development." 2–5.

Girum, A., Bundervoet, T., and Wieser, C. 2020. "Monitoring Impacts on Firms in Ethiopia Does the COVID-19 Pandemic Affect Women-Owned Firms."

Hassen, S., and Degu, T. 2019. "The Effect of Power Outage on Micro and Small Enterprise Productivity: Evidence from Urban Ethiopia." *Ethiopian Journal of Economics Vol. XXVIII No 1* 149–65.

Jain, R, Nandan, A. 2020. Electricity prices and firms' decisions and outcomes: The case of India after a decade of the Electricity Act. *Energy Economics*, 91(5):104915

Ikmal, A., Doumbia, D., Gregory, N., Ragoussis, A., Reddy, A., and Timmis, J. 2020. *Small and Medium Enterprises in the*

Pandemic: Impacts, Responses and the Role of Development Finance.

Ketema, M., and Diriba, G.. 2021. *Population Dynamics and Economic Development*. Vol. 26.

Kiran, D. R. 2020. "Kaizen and Continuous Improvement." *Work Organization and Methods Engineering for Productivity* 155–61. doi: 10.1016/b978-0-12-819956-5.00011-x.

Klug, T., Beyene, A,D., Meles, T.H., Toman, M., Hassen, S., Hou, M., Klooss, B., Mekonnen, A., and Jeuland, M. 2022. "A Review of Impacts of Electricity Tariff Reform in Africa." *SSRN Electronic Journal* 1–43. doi: 10.2139/ssrn.4105354.

Mano, Y., Akoten, J., Yoshino, Y., and Sonobe, T. 2014. "Teaching KAIZEN to Small Business Owners: An Experiment in a Metalworking Cluster in Nairobi." Journal of the Japanese and International Economies 33 (Sep.): 25–42.

Meles, T.H., Mekonnen, A., Beyene, A.D., Hassen, S., Pattanayak, S.K., Sebsibie, S., Klug,T., and Jeuland, M. 2021. "Households' Valuation of Power Outages in Major Cities of Ethiopia: An Application of Stated Preference Methods." *Energy Economics* 102:105527. doi: 10.1016/j.eneco.2021.105527.

Merima, A., Godart, O., and Seric, A. 2016. "Cluster Development Programs in Ethiopia : Evidence and Policy Implications." (January):35.

Ritika, J., and Nandan, A. 2020. "Electricity Prices and Firms' Decisions and Outcomes: The Case of India after a Decade of the Electricity Act." *Energy Economics* 91:104915. doi: 10.1016/j.eneco.2020.104915.

Shkabatur, J., Bar-el, R., and Schwartz, D. 2021. "Progress in Planning Innovation and Entrepreneurship for Sustainable Development : Lessons from Ethiopia." *Progress in Planning* (May):100599. doi: 10.1016/j.progress.2021.100599.

Tesfamichael, M., Yacob, M., Beyene, A.D., and Sebsibie, S. 2021. "Counting the Cost: Coping with Tariff Increases amidst Power Supply Shortfalls in Urban Households in Ethiopia." *Energy Research and Social Science* 71(June 2020):101860. doi: 10.1016/j.erss.2020.101860.

UNDP. 2017. "Understanding African Experiences in Formulating and Implementing Plans for Emergence: Growing Manufacturing Industry in Ethiopia." 68.

UNIDO. 2010. "Cluster Development for Pro-Poor Growth: The UNIDO Approach. Business, Investment and Technology Services Branch. Technial Paper Series." 1–32.

Woldehanna, T., Wolday A., and Yonis, M.B. 2018. "Correlates of Business Survival: Empirical Evidence on Youth-Owned Micro and Small Enterprises in Urban Ethiopia." *IZA Journal of Development and Migration* 8(1):0–26. doi: 10.1186/s40176-018-0122-x.

Yukichi, M., Akoten, J., Yoshino, Y., and Sonobe, Y. 2014. "Teaching KAIZEN to Small Business Owners: An Experiment in a Metalworking Cluster in Nairobi." *Journal of the Japanese and International Economies* 33:25–42. doi: 10.1016/j.jjie.2013.10.008.

Zeidy, I.A. 2020. "Economic Impact of Covid-19 on Micro, Small and Medium Enterprises (Msmes) in Africa and Policy Options for Mitigation." *Common Market for Eastern and Southern Africa* 11(12):23–34.

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The views expressed in this Working Paper do not necessarily reflect the UK government's official policies.