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Electricity Insecurity and Manufacturing SMEs

How does electricity insecurity affect businesses in low and middle income countries?

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Presentation overview

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Study aims and research questions

Study Aims

- Assess and quantify the impact of electricity insecurity on firm productivity and competitiveness, and on investment decisions for start-up and expansion
- Improve understanding of how SMEs mitigate the effects of electricity insecurity on their operations

Research Questions

- How does electricity insecurity impact on SME's productivity?
- How does electricity insecurity impact on SME's cost-competitiveness?
- How does the perceived threat of electricity insecurity influence businesses' decision-making when considering whether to move into a new area or develop their business?
- What strategies and tactics have SMEs developed (on both supply-side and demand-side) to cope with and mitigate the impacts of electricity insecurity?

Methodology

Methodology

1. **Literature review:** review of grey and published literature on how electricity insecurity affects manufacturing SME cost-competitiveness and productivity, influence on start-ups and investment decisions and on how SMEs cope.

2. **Data analysis:** analysis of firm-level surveys by looking at data from country-wide enterprise surveys in low- and middle-income countries and through regression analysis on data from the World Bank Enterprise Surveys for six selected countries.

3. **Qualitative interviews:** key informant interviews in four countries (Bangladesh, Nepal, Nigeria and Uganda) with SMEs and stakeholders from business development and finance organisations, government and the energy sector.

Methodology: Literature Review

Literature Review

- Two broad categories of literature were found:
  - empirical/statistical analysis (usually analysis of household/enterprise survey data)
  - anecdotal/qualitative approaches, within small areas or comparison across areas

- Literature explicitly on manufacturing SMEs is limited

- There is considerably more literature on the effects on firms of access to electricity than on electricity reliability

Methodology : Data analysis

Country selection and data focus

- 6 countries were selected for statistical analysis: Bangladesh, Nepal, Nigeria, Pakistan, Tanzania and Uganda
  - Selected for geographical location, proportion of SMEs and impact of SMEs in economy and importance of electricity insecurity
- Focus on manufacturing sector SMEs, and all SMEs in the enterprise survey data are formal sector
- Data source: World Bank Enterprise Surveys

Methodology : Data analysis

Regression Analysis

- Regression analysis carried out to determine effects of electricity insecurity on firms' total factor productivity, cost-competitiveness, investment and generator ownership
- Effect of electricity insecurity on SME productivity: regressions on enterprise total factor productivity, labour productivity and losses from outages
- Effect of electricity insecurity on cost-competitiveness: regressions on cost of electricity as proportion of total production costs and as proportion of non-labour costs
- Regressions on impact of electricity insecurity on investment, focusing on data on expenditure by enterprises on fixed capital

Key characteristics of samples analysed

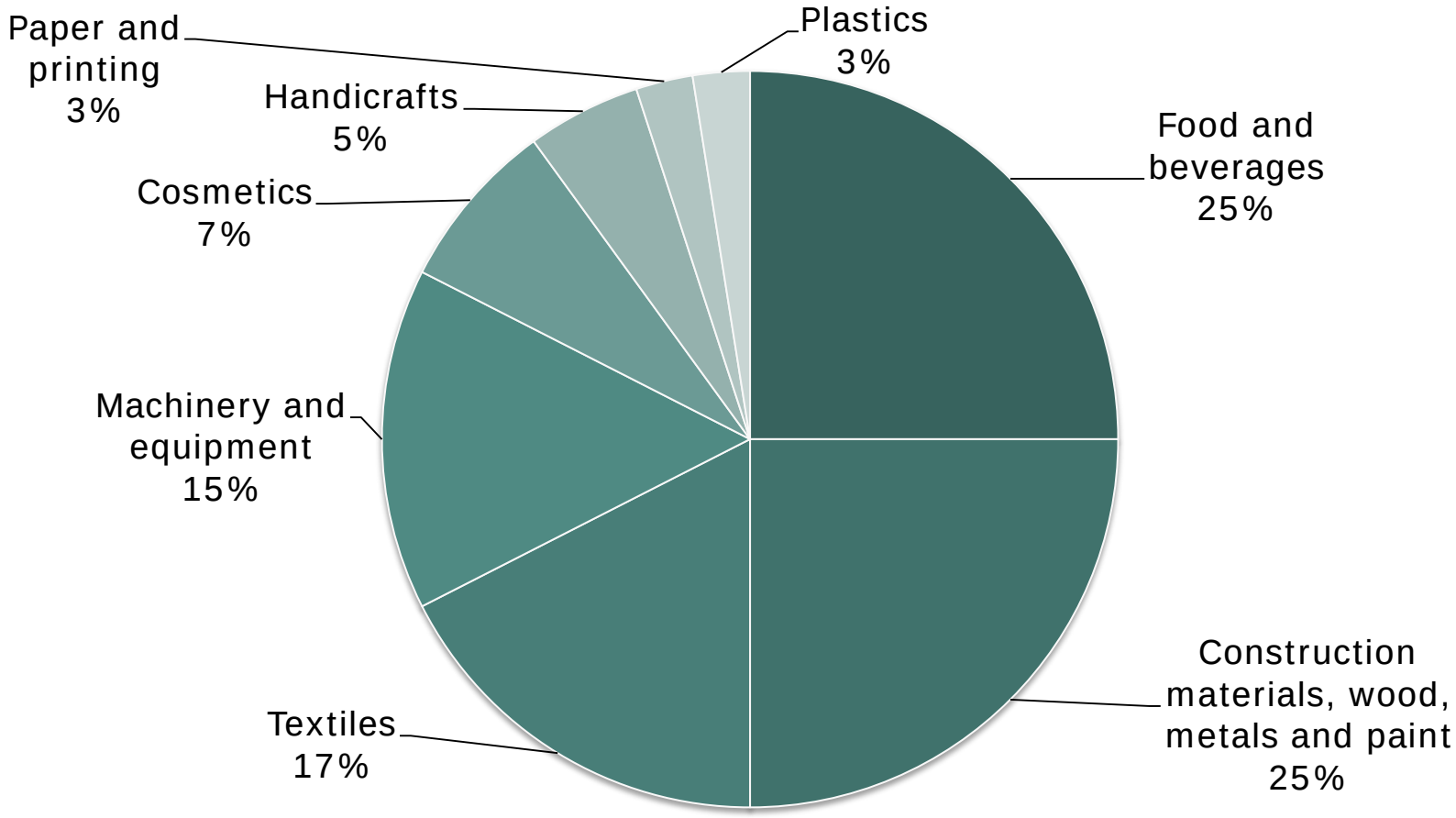
	Bangladesh	Nepal	Nigeria	Pakistan	Tanzania	Uganda
Enterprise Surveys						
Year of survey	2013	2013	2010	2004-07	2006	2006
Total number of firms	1180	241	1549	935	273	307
Number of SMEs	819	180	1485	771	239	282
Average age of firms (years)	20.9	18.8	17.0	23.1	14.3	12.8
Proportion (%) owning a generator	57.8	56.0	83.9	30.8	49.1	27.7
Number of outages per month	80.0	13.3	30.3	32.8	11.7	11.0
Average duration of outage (hours)	1.35	3.76	8.92	2.22	7.44	11.17

Source: World Bank Enterprise Surveys

Methodology : Qualitative Interviews

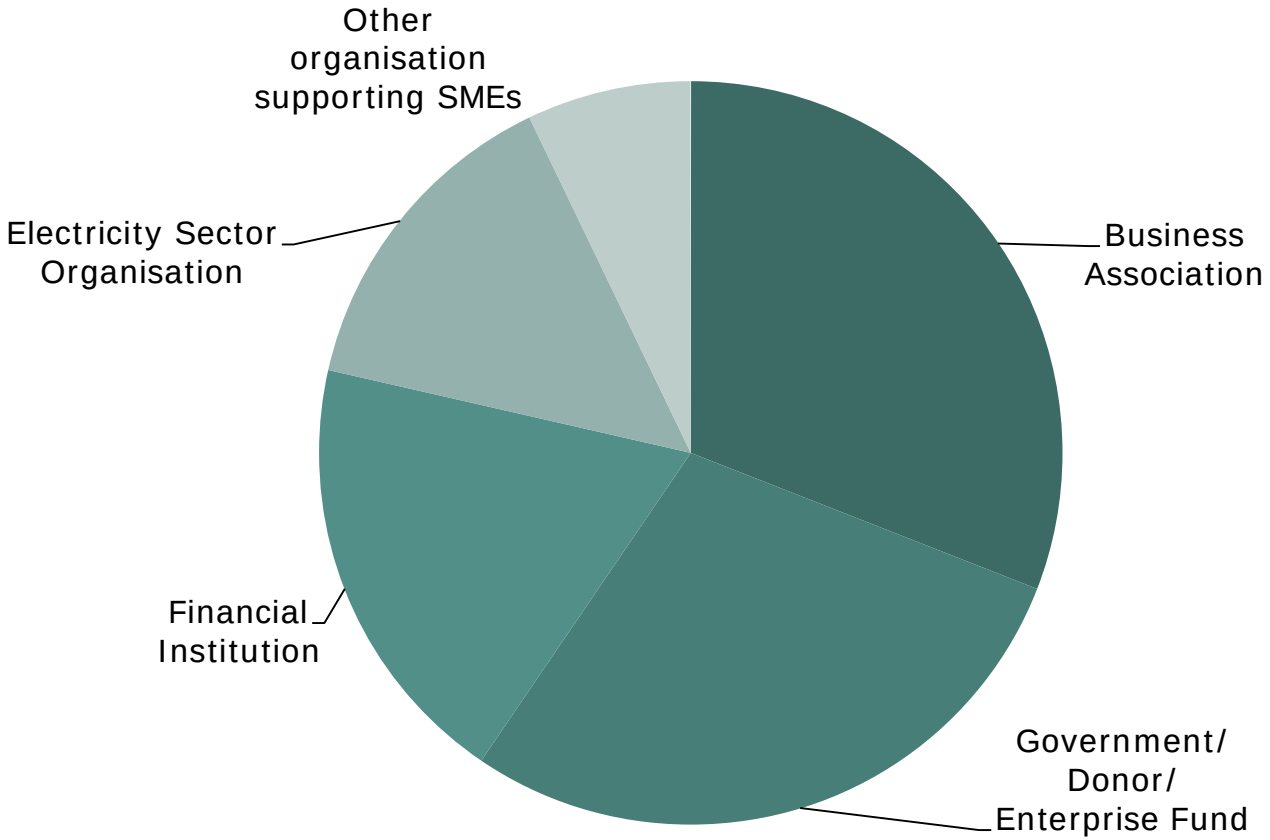
- Key informant interviews were conducted in 4 countries: Bangladesh, Nepal, Nigeria and Uganda.
- Semi-structured interviews conducted with 40 SMEs and 42 stakeholders (e.g. business associations, financial institutions, enterprise funds, investment authorities and energy sector organisations)
- Interview questions to SMEs addressed their experiences with electricity insecurity and the impact on their business, and how they cope
- Stakeholders were asked about their perceptions of impacts on productivity and investment, and suggested best practice on mitigating strategies

Overview of research findings: Qualitative Interviews



SMEs interviewed by sector

Overview of research findings: Qualitative Interviews



Stakeholders interviewed by type of organisation

SMEs and Electricity Data Overview

Overview: SMEs

- MSMEs in emerging markets: almost 90 million
- Proportion of jobs in the developing world provided by MSMEs: two-thirds
- Proportion of new jobs created by informal sector in Africa: 93%
- Proportion of SMEs in the manufacturing sector: 22%

Sources: IFC MSME Country indicators, World Bank Enterprise Surveys

Electricity

- Cost to get electricity in sub-Saharan Africa (as a percentage of income per capita): 4,736.9%
- Days to gain access to electricity in South Asia: 148
- Electricity losses as a percentage of output in South Asia: 20.3%
- Hours for an average outage in South Asia: 2.4 and SS Africa: 5.3
- Percentage of SMEs identifying electricity as a major constraint in SS Africa: 48.8% and South Asia: 51.1%

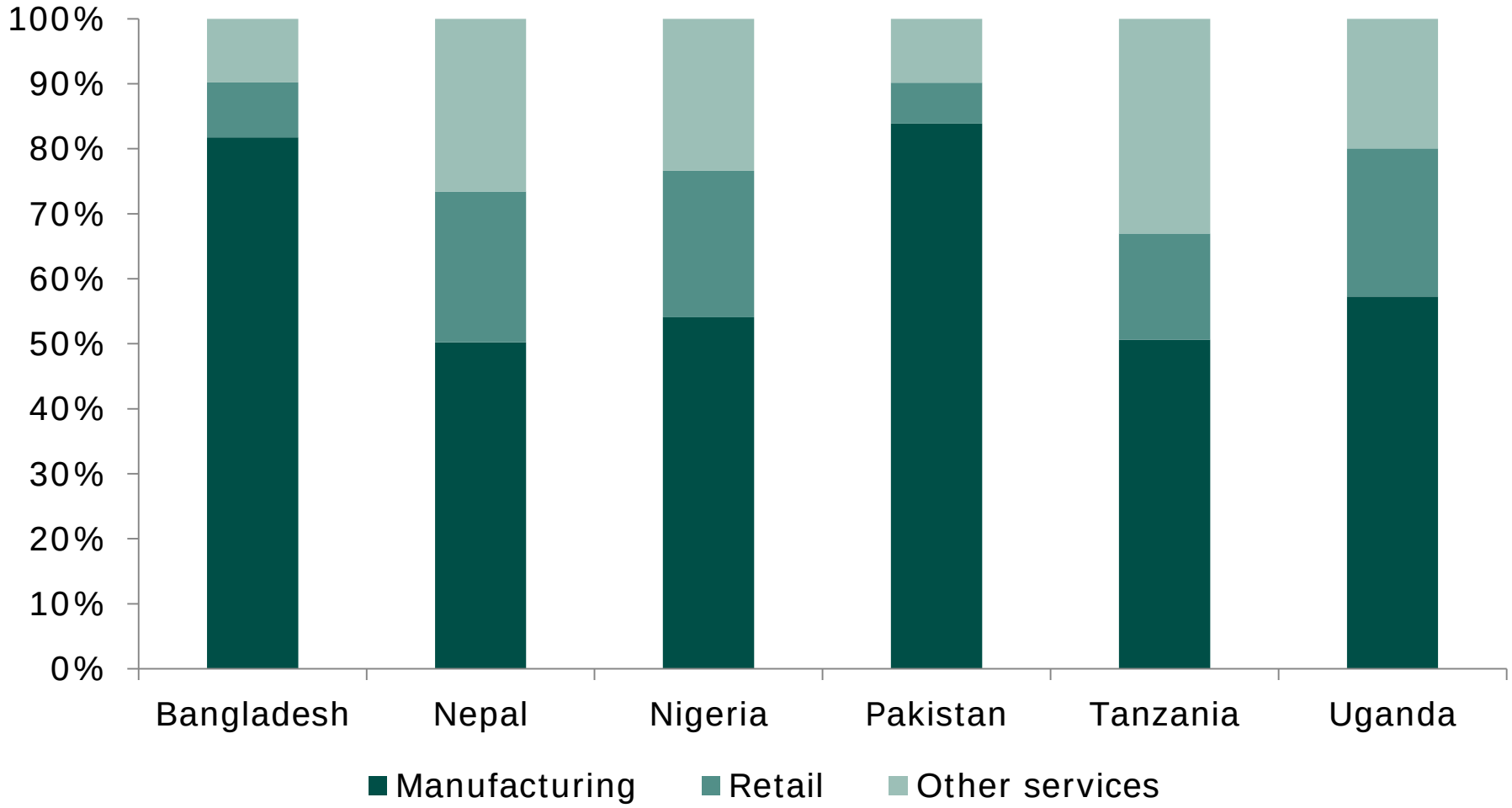
Sources: IFC MSME Country indicators, World Bank Enterprise Surveys

MSME indicators for selected countries

Country	MSME definition (no. workers)	% MSMEs in manufacturing	MSMEs per 1,000 people	Informal MSMEs per 1,000 people	MSME employment (% total)
Bangladesh	1 - 99	28.8%	20.1	40.5	12.8
Nigeria	1 - 50	-	61.1	61.1	50.0
Nepal	0 -199	74.6%	1.7	-	76.1
Pakistan	1 - 250	48.3%	18.7	-	78.0
Tanzania	1 – 99	8.9%	1	76.7	-
Uganda	1 – 99	12.9%	6.2	40.7	6.1

Source: IFC (2013)

Sectoral distribution of SMEs in selected countries



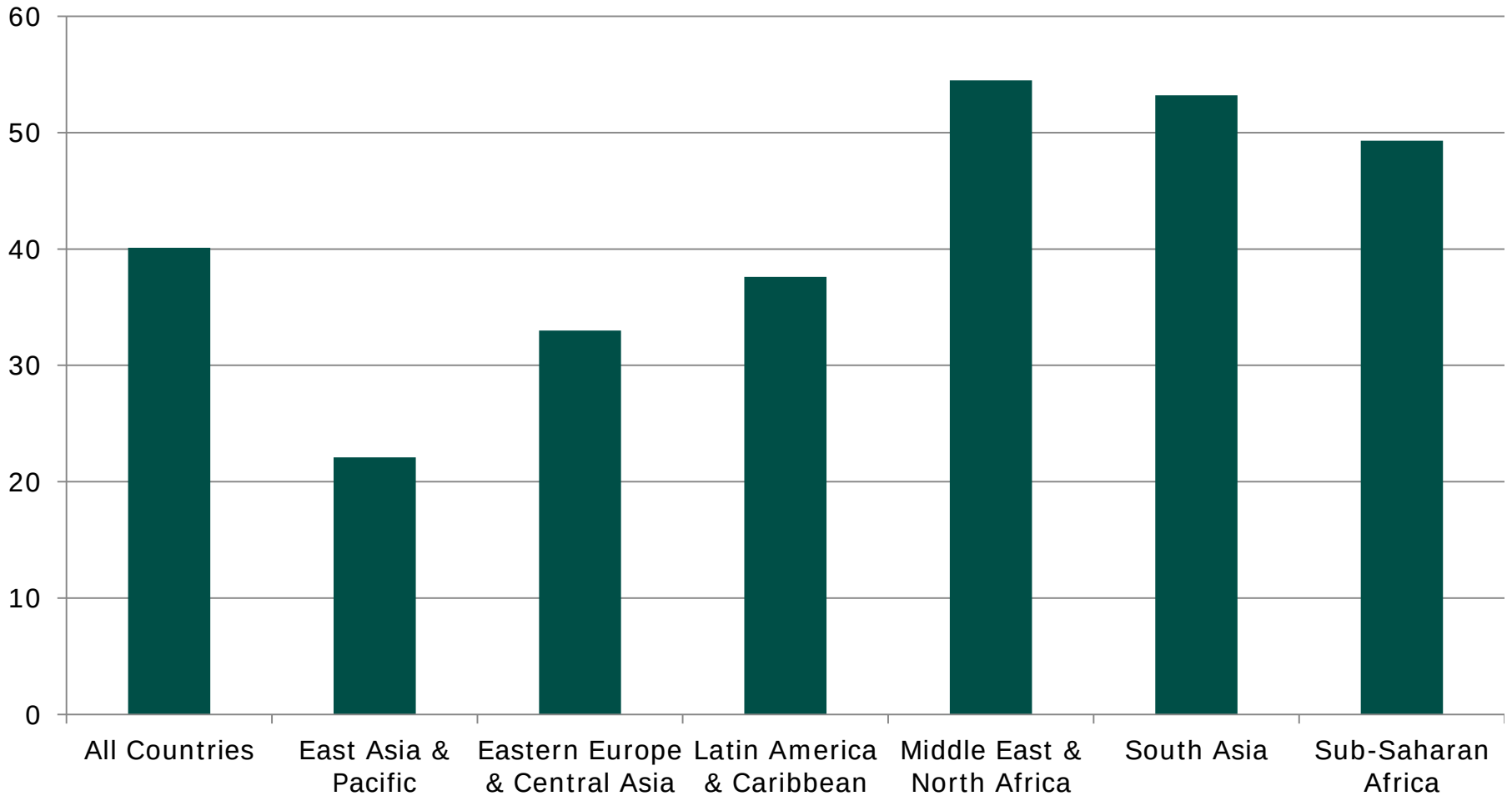
Source: World Bank Enterprise Surveys

Quality of electricity in selected countries

	Number of electrical outages in a typical month	Duration of a typical electrical outage (hours)	Losses due to electrical outages (% of annual sales)	Percent of firms owning or sharing a generator	Proportion of electricity from a generator (%)	Days to obtain an electrical connection (upon application)	Percent of firms identifying electricity as a major constraint
Bangladesh	100.7	1.1	10.1	52.3	11.9	50.3	78.4
Nepal	8.7	1.2	10.4	50.5	7.4	21.3	68.8
Nigeria	25.2	7.8	8.5	85.6	52.1	7.5	75.9
Pakistan	31.7	2.1	8.2	20.1	6	106.3	74.5
Tanzania	9.1	6	7.3	45.7	16.8	44.3	88.4
Uganda	10.7	9.7	9.4	28.9	8.9	33	84.2

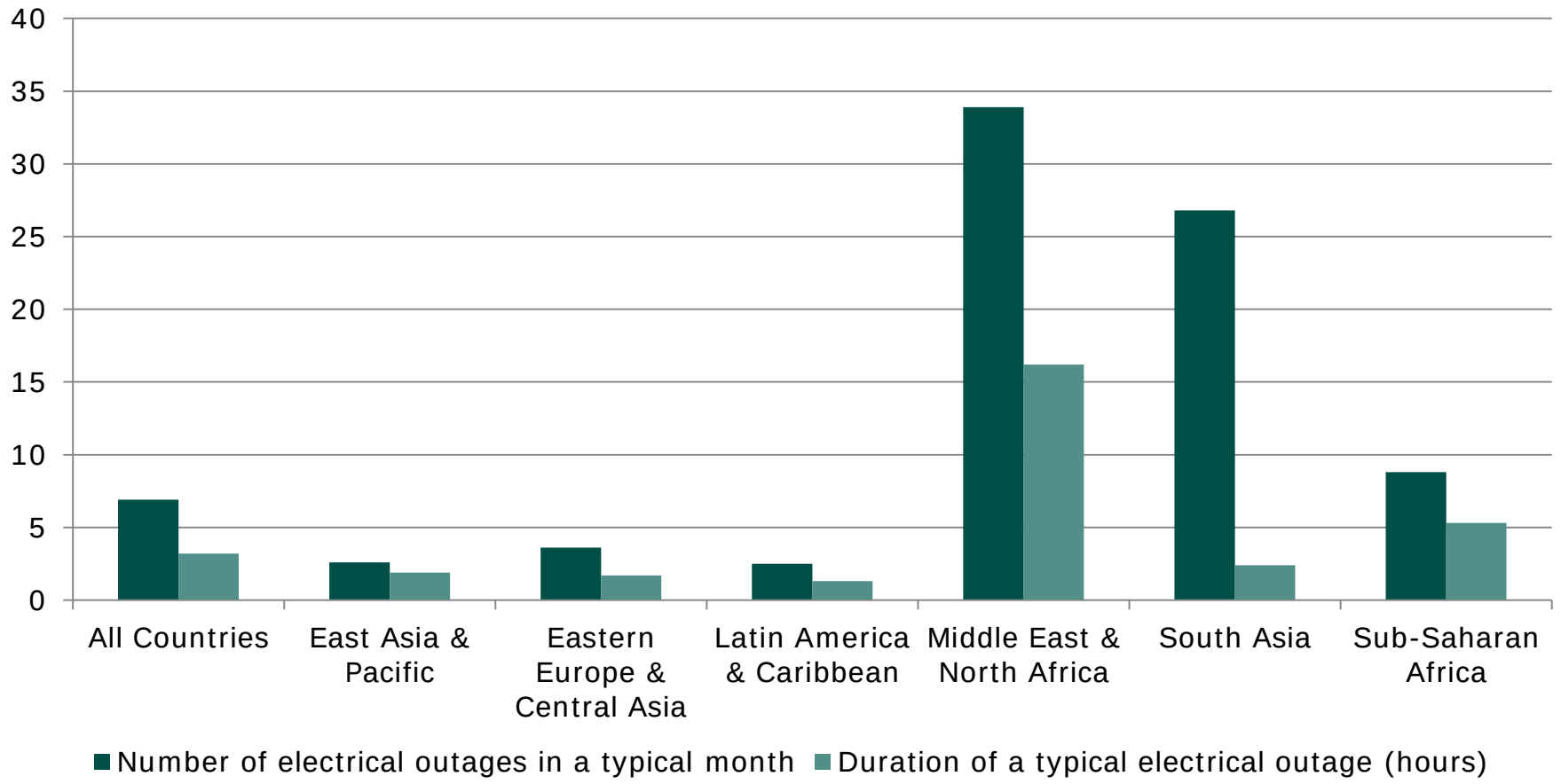
Source: World Bank Enterprise Surveys

Percent of firms identifying electricity as a major constraint



Source: World Bank Enterprise Surveys

Outages by number and duration



Source: World Bank Enterprise Surveys

Electricity insecurity experienced by small, medium and large firms

	Number of outages per month			Sales(%) lost due to outages		
	Small	Medium	Large	Small	Medium	Large
Bangladesh (2013)	64.5	73.1	53.0	7.0	4.4	4.9
Nepal (2013)	11.3	31.8	4.7	18.1	20.2	n/a
Nigeria (2010)	24.9	25.7	29.0	9.1	8.5	6.8
Pakistan (2007)	32.0	34.5	21.6	9.2	9.4	7.6
Tanzania (2006)	9.2	8.8	12.2	17.4	18.9	13.7
Uganda (2013)	5.3	10.5	4.5	10.7	14.4	13.7

Source: World Bank Enterprise Surveys

Cost distribution of firms

Country	Labour costs (%)	Electricity costs (%)	Materials costs (%)	Other costs (%)
Bangladesh	14.26	2.20	78.43	4.95
Nepal	6.91	2.69	85.71	4.62
Nigeria	11.26	0.37	79.81	8.35
Pakistan	7.50	3.72	84.04	4.74
Tanzania	11.57	2.39	90.20	6.86
Uganda	10.27	1.61	73.22	12.30

Source: calculated from World Bank Enterprise Surveys

Electricity Insecurity and SME Productivity

“Access is very, very cheap, if everything was working properly…”

Onitsha Chamber of Commerce employee

Nigeria experiences 25.2 outages a month, lasting an average of 7.8 hours

Everything goes hand in hand, so for example without electricity it is hard to use technology, no electricity means lower levels of productivity from using more basic tools. Manual labour is slower."

Federation of Women Entrepreneurs Association Nepal

Electricity Insecurity and SME Productivity

- Many firms which experience outages have lower productivity but the results are mixed
- When electricity insecurity is measured in terms of duration and frequency of outages, lower productivity is associated with more frequent and longer outages
- There is no consistent variation in the effects of outages on labour productivity between different types of SME
- Variation in findings between countries seems to be related to differences in geography, economic structure and SME sector, and overall business environment

Electricity Insecurity and SME Cost-competitiveness

“Our prices are competitive among similar companies that are doing quality services, but higher than small companies who don’t care about quality. This is a big challenge. We are losing clients to those low quality companies”

Medium-sized bakery business in Uganda

Electricity insecurity and SME cost-competitiveness

- Absence of literature on the influence of electricity insecurity on SME competitiveness
- SMEs experiencing outages do not necessarily have higher unit costs of production
- Explanation for the absence of significant effect on unit cost:
  - the small proportion of electricity in total costs
  - outages stimulate better management practice, reducing negative effects on unit costs
- Competitiveness also depends on product quality and ability to meet orders on time, neither of which are captured in enterprise survey data

Electricity Insecurity and Investment

“I’m seeing a tendency of people becoming middlemen rather than involving in the production process. Such middlemen would easily have involved in production had there been enough electricity and no additional cost for diesel generator”

Small-sized Nepalese coffee processing SME

“Investment decision has not much to do with electricity availability because our biggest problem in investing more is that we are not able to compete with cheap Chinese products”

Medium sized Nepalese textile SME

Electricity insecurity and SME investment

- Literature reveals a lack of finance and poor infrastructure influence growth of medium and large firms; small firms are more affected by business regulations
- Electricity insecurity can influence investment decisions, but is neither the only nor the most significant factor
- No consistent finding about the impact of greater electricity insecurity on investment, nor of different impact for more capital-intensive firms
- Electricity insecurity seems to have a greater bearing on the growth of medium and large firms than small firms, and on the location of investments by SMEs

Mitigating the impacts of Electricity Insecurity

“SMEs are very used to coping and try to find ways to manage power outages. Many have to work at night because of load shedding during the day, but this is difficult – women have housework and childcare obligations in the evenings and for enterprises operating outside the home, factories and offices need to close for employees to go home”

Federation of Women Entrepreneurs Association Nepal

“Stand-by generator not used for running the machine because, it would be too expensive. Better to limit hours of operation.”

Garment printing SME, Bangladesh

“When power is off, production is at standstill and thus, the staff has to wait for it to be back or else close and wait for another day. They have no any other alternative source of power.”

Small engineering SME in Uganda

Mitigating the effects of electricity insecurity

What do firms do?

- Backup generators are the most common mitigation solution, although not necessarily for motive power
- Limit hours of production
- Change production processes
  - Shift patterns and load shedding
  - Manual labour
- Alternative fuel sources
  - Diesel engines
  - Renewable energy

Mitigating the effects of electricity insecurity

Opportunities to improve mitigation practices

- Accept generator use a fundamental, improve access and technology
- Facilitate generator sharing
- Grid power improvement
- Load shedding schedules – to allow for good management practices and changes in operation
- Support to access renewable energy

Conclusions

Policy conclusions

- Improve the reliability of grid electricity supply – short-term action to reduce technical faults and longer-term interventions to increase generation capacity
- Where unreliability is caused by lack of generation capacity, provide reliable load shedding schedules, as these can reduce the impact of outages
- Improve access to alternative energy sources such as generators and renewable energy, through credit schemes, tax or duty concessions and shared ownership arrangements
- Provision of information and skills/advice (associations)

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