



E-invoicing adoption under loadshedding in Zambia

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- Since 2024, all Zambian firms must use electronic (“smart”) invoices for Value-Added Tax (VAT) reporting. This rollout coincided with daily loadshedding (electricity shortages), making adoption difficult.
- Based on interviews with 61 firms, this report explores the long-term benefits of smart invoicing, while recognising the short-term adoption challenges.
- The key findings of the survey are:
 - **Informality shifts** - Firms unable to issue smart invoices due to loadshedding lose formal business and revert to informal trade. **In the short term, informality among formal firms increases.**
 - **Compliance gains** – Firm awareness and adoption of smart invoicing are high thanks to the efforts of the Zambia Revenue Authority. **In the long term, this should increase compliance and tax revenue.**

POLICY BRIEF ZMB-25309

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POLICY RECOMMENDATIONS

1. Facilitate smart invoicing adoption by Small Retail Firms. Steps include (a) develop phone-based (e.g. USSD) invoicing, (b) create a light version of the software (with fewer fields per invoice), (c) continue the Consumer Incentive Scheme, and (d) discuss the potential creation of solar point-of-sales connected to Smart Invoice.
2. Engage with ZESCO to adapt load-shedding schedules in areas with many small retail firms.
3. Commission targeted policy research with smart invoicing data to quantify long-term gains and short-term challenges in domestic resource mobilisation.

Motivation

The ratio of collected taxes to national income is three times lower in low-income than in high-income economies (Bachas et al., 2024). In Zambia, two main challenges hinder domestic resource mobilisation (DRM):

- **Non-compliance:** the tax gap is of circa 50% (Adu-Ababio et al., 2023).
- **Informality:** it accounts for 40% of GDP (Elgin et al., 2021) and 75% of employment (Zambia Statistics Agency, 2024).

To enhance DRM, the Zambia Revenue Authority (ZRA) introduced “smart” (electronic) invoicing in 2024. For each transaction, sellers transmit in real-time a “smart” invoice for Value-Added Tax (VAT) purposes to the buyer and to the ZRA.

With VAT contributing to one-third of tax revenues and gaps suggesting that only 40% of potential VAT is collected, smart invoicing is central to improving DRM.

Unfortunately, the rollout of Smart Invoice coincided with unprecedented load shedding, with firms lacking power for up to 19 hours daily. As Smart Invoice is software-based, the lack of electricity to power a laptop is a direct barrier to its adoption.

Therefore, in this report, we ask: how does the adoption of smart invoicing under loadshedding impact firm behaviour? I provide survey evidence that adopting smart invoicing with scarce and costly electricity is challenging. Firms

unable to bear electricity costs lose formal customers and revert to informal operations.

Survey methodology

The survey targets 61 firms selling to final consumers. I focus on those firms as they are the most likely to evade VAT (Siwale et al., 2021). Most of my sample consists of retailers (72.1%, Figure 1). While they make up the largest group in terms of VAT registrations (Table 1).

They rank only 14th when looking at the average size of VAT claims (Table 2). Because they are numerous but small, any changes in the costs of staying formal will be felt in this sector the most.

I select three types of malls as most retail firms in Zambia are located there:

- Formal malls (39%) include mostly chain stores. They provide constant electricity access via generators.
- Semi-formal malls (39%) are areas grouping many firms, but with no shared access to electricity and lower levels of formalisation.
- Firms outside of malls (21%) are less likely to be audited by tax officials due to their geographic isolation. They have private electricity access.

FIGURE 1: Sectors and mall type of surveyed firms

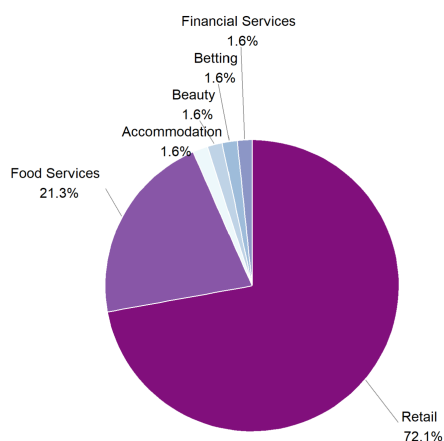


Table 1: Unique VAT Filers (2014-2023)

Rank	Sector	Registrations
1	Wholesale & Retail	7112
2	Construction	1690
3	Manufacturing	1629
4	Other Services	1209
5	Transport & Storage	920
6	Prof, Sci & Tech	917
7	Admin & Support	802
8	Agri, Forestry & Fish	676
9	Accomm & Food	560
10	Mining & Quarrying	493

Mall Type of Surveyed Firms

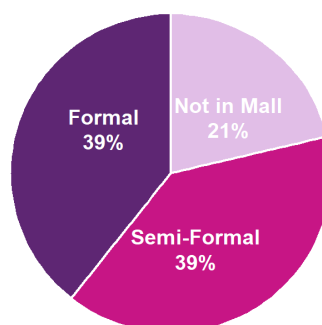


Table 2: Average Monthly Absolute VAT Claims (2014-2023)

Rank	Sector	Average Monthly VAT Claim ('000 ZMW)
1	Mining & Quarrying	2034
2	Utilities	645
3	Finance & Insurance	374
4	Info & Comm	355
5	Admin & Support	201
6	Manufacturing	153
7	Real Estate	104
...	...	...
13	Wholesale & Retail	59
14	Accomm & Food	51

Key findings

Load shedding severely affects firms. Back-up power helps to mitigate the loss, but it is too costly to sustain full productivity.

- **Loadshedding varies significantly across areas.** Firms report between five and 15 hours of electricity. This also depends on a firm's proximity to public facilities (e.g. hospitals).
- **79% of firms invested in a back-up power alternative:** 31 have fuel-based generators ("gensets"), 11 have solar panels, six have a battery (and an inverter) that charges when power is on.
- **Firms reduce their productivity when running on back-up power to limit costs.** Installing solar panels costs a median of 75 months of electricity spending, and the monthly purchases of fuel for generators ("gensets") are 16 times higher than the monthly electricity bill (Figure 2).
- **Most firms lost customers,** despite having back-up power (Figure 3).
- **To limit the costs of back-up power, firms adapted their production:**
 - **Energy-intensive machines are turned off.** Examples include computers, printers, refrigerators, ovens, electric cookers, irons, and TVs.
 - **Electricity-dependent products are harder to stock and face lower demand:** this includes cold-chain products and electronic appliances.
 - **Customer trust declines:** in-store testing of electric appliances is difficult, online customer service is limited, and the quality of cold-chain products is unpredictable.

FIGURE 2: Cost of back-up power compared to electricity spending

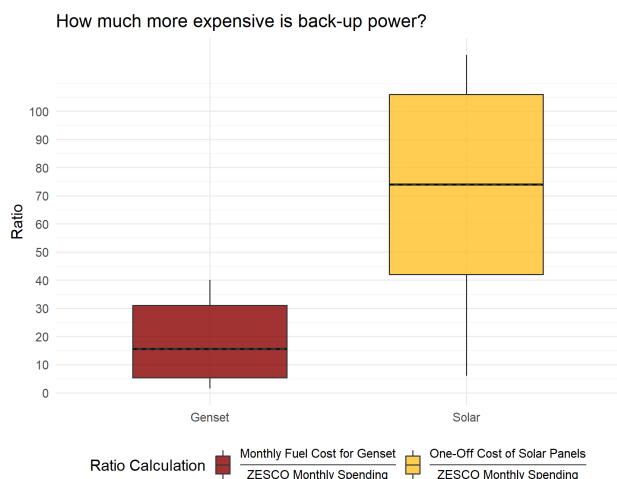
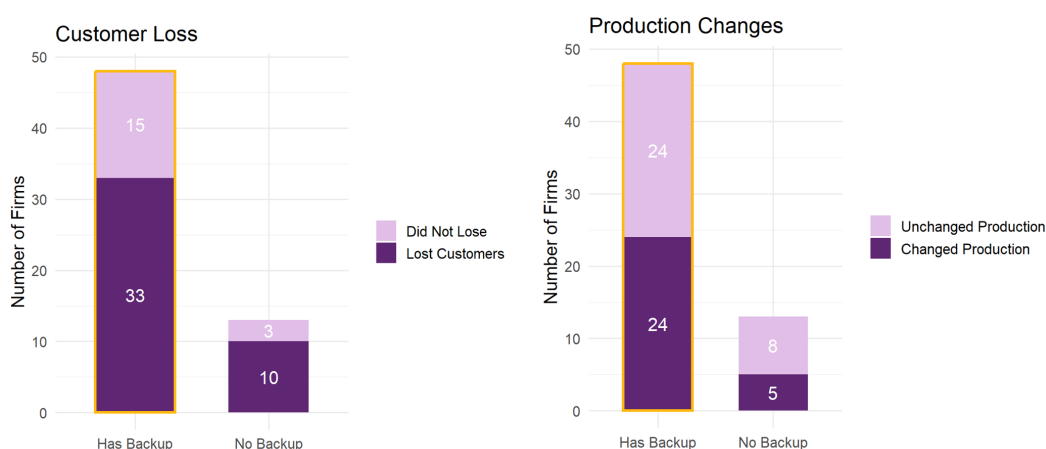


FIGURE 3: Customer loss and production changes due to load shedding



As loadshedding has significant effects on economic activity, how do firms adopt smart invoicing, which requires electricity?

There is high awareness and growing adoption of smart invoicing: 55% of surveyed firms know of it, and among them, 64% adopted it.

Three main factors contribute to the adoption of Smart Invoice:

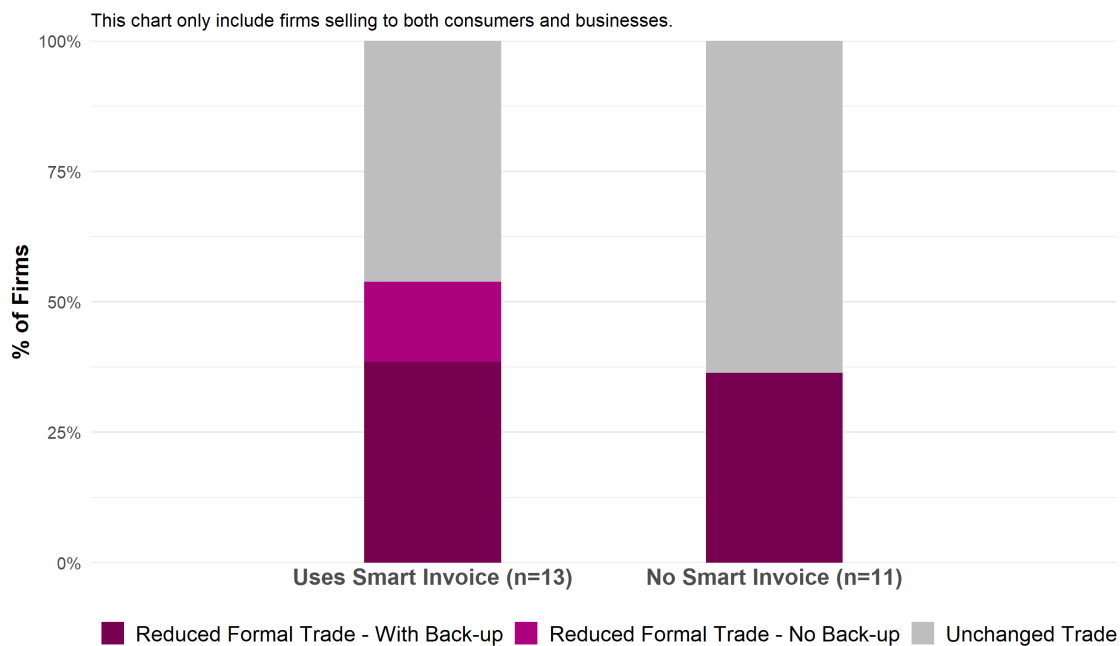
- **Formal buyers requesting smart invoices** to claim input VAT credits.
- **Visits by tax officials** to raise awareness about the technology.
- **Free training on smart invoicing** by the ZRA. 82% of surveyed firms that adopted Smart Invoice received training from ZRA.

The main barrier to adopting Smart Invoice is the lack of reliable electricity, as the technology requires a computer. This challenge led to **informality shifts**. Among surveyed firms selling to businesses, 54% of those using Smart Invoice and 37% of those not using it report **losing formal customers due to not issuing e-invoices** (Figure 4). **Back-up power does not mitigate this**, as firms report that it is unreliable and too costly to allow for constant use of Smart Invoice.

Formal trade declined as firms cannot trade with formal businesses without issuing smart invoices.

Firms report not using Smart Invoice when they have many consumers in the store, as issuing a Smart Invoice is time-consuming and risks losing other customers. Restaurants reported selling mostly informally as business customers stopped coming after they could not be issued a smart invoice during a genset failure. Retail stores (e.g. furniture, appliances) lost sales as former customers walked in during power cuts, when smart invoices could not be issued.

FIGURE 4: Formal Trade declined as load shedding affected e-invoicing adoption



Policy recommendations

- Small retail firms struggle to adopt Smart Invoice due to load shedding. Policy action could facilitate the use of the system. Steps include:
 - **Continue the development of phone-based (e.g. USSD) invoicing**, which does not require internet or powering a computer. This solution overcomes connectivity challenges and requires little training, as small firms already use the USSD technology for mobile money transactions.
 - **Introducing a light version of Smart Invoice** that requires fewer fields per invoice. This would facilitate the adoption of the solution via smartphones and for firms with limited tax literacy.

- **Continue the Consumer Incentive Scheme**, as buyers requesting e-invoices are the main incentive for firms to adopt smart invoices.
 - **Discuss the creation of solar point-of-sales** connected to Smart Invoice.
- **Engage discussions with ZESCO to adapt loadshedding schedules in areas with numerous small retail firms.** Those firms cannot afford reliable back-up power and are the most likely to revert to informality when electricity becomes too costly.
- **Commission targeted policy research** with smart invoicing data to refine the survey-based findings of this brief. These data allow us to quantify long-term gains and short-term challenges in domestic resource mobilisation.

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