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To Drive Structural Transformation, Stop Counting Connections — Focus First on Ensuring Reliable Electricity

BLUF: Investments in electricity generation and transmission generate higher economic returns than investments in expanding access. Reliable electricity is a key enabler of structural transformation — and improving the quality of electricity supply is a cost-effective way to help economies grow.

What do countries need to grow?

What do poor countries need to grow? To summarize hundreds of years of economic and political research: countries need strong governance, rule of law, and a state that provides high-quality infrastructure.

We know that the lack of such infrastructure — good roads, reliable electricity, clean water — inhibits growth [1]. But which should states invest in first? Fiscal constraints mean developing countries must often pick and choose which pieces of key infrastructure they will build, and what can wait for another day.

Improving electricity supply is one of the highest-return investments they can make, far more so than building another highway [2]. This is particularly true if countries want to prioritize structural transformation — to go from a norm where industries have low productivity but are highly labor-intensive to one with higher productivity and higher skills.

Reliability vs. access

One important caveat: countries that want to supercharge growth should focus on improving electricity *reliability*, rather than access.

This would be a change from the status quo; much of the investment in electricity to date has focused on access rather than reliability. Access is often prioritized because it is easier to measure; either a household is connected to the grid or it's not. Defining 'reliable electricity' is harder; after all, an American would consider an hour of outages a day to be wildly unreliable electricity, while most Nigerians would consider that a drastic improvement [3].

Expanding *access* to electricity may have many positive benefits — but it does not seem to generate particularly high economic returns for governments. In Kenya, the wage returns to an additional household gaining access to electricity were near zero [4].

While it is difficult to say for certain why access is not economically transformational, we can make some suppositions. When a household gains access to electricity, they rarely gain access to much electricity. Generally, they will get access to a small amount of electricity that works a

few hours a day. It might be enough to charge a phone, or power a lamp, but good luck running a simple refrigerator off the available supply [5].

This unreliable supply makes running a business very difficult. In India's six most populous states, people experience an average of 11 hours of power outages a day [6]; in Nigeria, it's 17 hours. This means businesses only get 7 hours of grid power daily [7]. Nor is it seven continuous hours; power may come and go throughout the day.

Access without reliability makes structural transformation nearly impossible. The largest, most productive companies today simply could not function without reliable, abundant power. Multinationals are unlikely to put manufacturing centers in countries where machines cannot run all day; even outsourcing call centers can be difficult with near-constant power cuts. Multinationals don't want to deal with this hassle; they simply choose to locate somewhere where power is more reliable [8].

Local firms suffer too; imagine running a restaurant when your fridge may turn off at any moment, or an accounting firm where you cannot use desktop computers. Businesses supplement by buying generators and providing their own power, but this is expensive [9]. This leaves less money available for other investments and means businesses don't have the capital to invest in long-term growth [10]. This depresses employment and wages [11].

The returns to reliability

All of this means that — in contrast to the relatively small returns to improving access — the returns to improving reliability are high.

In a macroeconomic model, Fried and Lagakos 2020 estimates that eliminating outages in some African countries would improve productivity so much that average wages would rise 6-20% [12]. Note that these wage gains aren't seen immediately — but in the long term, more firms use electricity and improve their productivity. They would sell more items and pay their workers more. And 20% is a huge wage increase — equivalent to *all* of Nigeria's growth over the last 20 years.

Another paper estimates that eliminating outages in Ghana would result in a 10% increase in total factor productivity [13]. When productivity increases, average wages increase by roughly the same amount [14]. Local employment might rise by even more than 10% [14].

People also *want* their electricity to be more reliable. Consumers in India would be willing to pay *2500%* more for more reliable electricity [7].

ROI for reliability

But knowing that there are high returns to reliability is not the same as proving that investing in reliability would be cost-effective. Improving the grid would not be cheap.

In many parts of Africa, the grid simply does not provide the amount of power needed. In Nigeria, power demand is often four to ten times higher than what can be provided [15].

But building generation and transmission capacity can be one of the more expensive things a state can do; a single power plant can cost a billion dollars [16]. Is it really worth it to try to increase reliability?

The evidence suggests yes. Let's consider a project like the Azura power plant in Nigeria. It cost about US$900 million to build, and will produce about 460 MW of power for 30-40 years [16]. If we assume it will run about 50% of the time, similar to other plants in Nigeria [17, 18], it will produce 60 billion kWh of electricity. That is 60 billion kWh that Nigerians won't have to use generators.

Producing one kWh from a generator costs about $0.39 [19], while it costs about $0.15 to generate one kWh from a power plant in Nigeria (this excludes capex cost, which is accounted for in the cost of the plant) [20]. For each kWh added to the grid, Nigerians save around $0.24. Across 30 years, Nigerians will save over $14 billion dollars because they spent $900 million building a power plant, or a benefit-to-cost ratio of 16.

This is quite a high return on investment. We can compare against the Copenhagen Consensus, which attempts to find the "best buys" in global development. They consider an invention a "best buy" if the benefits are more than 15 times the cost [21]. Improving power supply would qualify as a best buy.

Furthermore, economist Abdoulaye Cisse has estimated the internal rate of return for reliability projects in Senegal often exceeds 30% [22], well above what most businesses target [23].

This makes sense. It is difficult to imagine a poor country becoming a middle-income country without investing in reliable power supplies. Any transition away from agriculture to manufacturing seems to require it.

Improving power supply might be expensive and difficult, but ultimately, it is required for an economy to reach its productive potential. Investing in electricity supply and reliability allows businesses to grow and the economy to flourish in ways that are simply not possible otherwise.

Endnotes

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