

# Technology Exports, Electricity & Industrial Dev't in African countries

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# Outline

Introduction

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# The Need to Industrialize

- Now more than ever, African countries are called to respond to the need for positive economic growth and industrialization.
- COVID-19 has triggered a global recession that places African countries back in debt and burdened with economic recovery
- Despite recent growth in Africa, very little structural change has been seen (Diao et al., 2019; Rodrik, 2018).
- Therefore, there's opportunity for industrialization through industrial policy.

# Export-Led Growth and Industrialization

- Manufacturing-led industrialization: A practical pathway to growth. Supported by theory and empirical studies (Su and Yao, 2017; Szirmai and Verspagen, 2015; Sheridan, 2014; Szirmai, 2012).
- Therefore, manufactured exports positively influences growth. Witnessed later in development process.
- However, the technology content of exports is also important.
- Low-tech exports do not contribute much to productivity and value added (Hausmann et al., 2007; Xu, 2000; Fosu, 1990).

## Export-Led Growth and Industrialization ...

- However, some scholars argued for specialization based on comparative advantage (Lin, 2012).
- No country has a comparative advantage in technology. Countries gain competitive advantage over time - learning by doing, etc. (Lin and Chang, 2009).
- Technology exports will help African countries gain competitive advantage despite existing challenges from premature deindustrialization and market liberalization.

## Export-Led Growth and Industrialization ...

- However, one key challenge affecting this pathway is electricity production and this is critical to the tech export industrialization path.
- Electricity demand exceeds supply and power supply outages are common in many African countries (Aidoo and Briggs, 2019; Andersen and Dalgaard, 2013).
- Electricity supply challenges and power outages also persist in the SADC region also (Prasad et al., 2018; Sekantsi and Timuno, 2017; Kesselring, 2017; Dube et al., 2014).

# Sample View of Electricity Capacity in Africa

Figure: Electricity Capacity in Africa

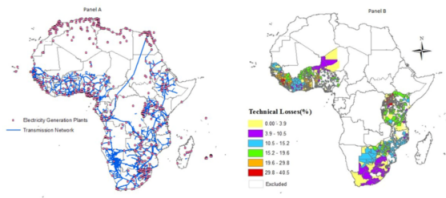


Figure 3: Electricity Transmission Network, and Technical Losses in the Network by District

Notes: Technical Losses by district is computed using the total transmission and distribution losses% of total electricity production weighted by the relative distance between the district centroid and the generation plant along the transmission network.

Source: Mensah et al. (2016)

# The Research Problem





## The Research Problem ...

- Power supply can affect for regional industrial development, through trade and commerce (Makgetla and Levin, 2020).
- Main RQ: To what extent does technology exports and electricity production influence industrial development and growth in African countries and in Southern Africa?
- This research is important for industrial policy formulation because stable power is important for industries to stay competitive.
- Contributions to the academic literature on determinants of industrialization and those that have looked at the impact of electricity access in Africa (Aidoo and Briggs, 2019; Allcott et al., 2016; Chakravorty et al., 2014; Lipscomb et al., 2013; Haraguchi et al., 2019; Martorano et al., 2017; Guadagno et al., 2016).

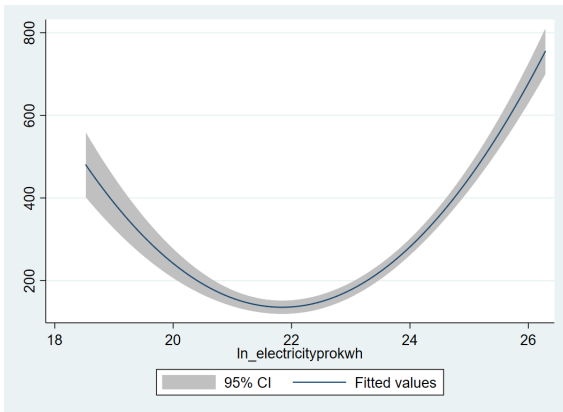
## Data & Methodology

- Data is obtained for African countries. The data is sourced from WDI, ADI (electricity production data), PWT (Human capital data), Boix et al. (2014) and Chinn and Ito (2006).
- Econometric approach involves of estimation of model by Haraguchi et al. (2019). We adapt the model by including interactions between tech exports and electricity production.
- Sample period is 1990 - 2016 and was chosen based on data availability for 22 African countries.

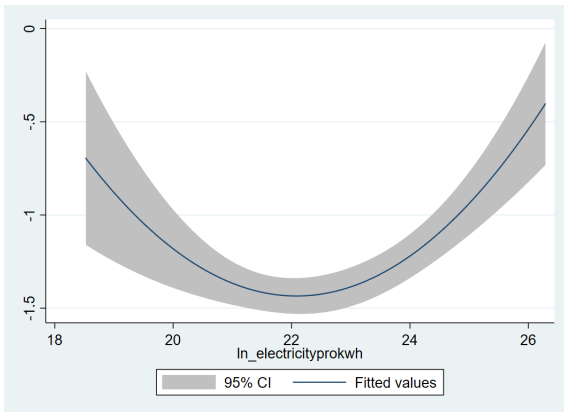
## Data & Methodology...

- MVA per capita is used as measure of industrialization and growth, in line with the literature Rodrik (2016).
- The analysis shows the influence of medium and high tech exports and electricity first. Later on, we tested the influence of low tech exports and electricity on MVA per capita.
- Regional level analysis for West Africa and Southern Africa.
- Other control variables include private sector credit (% of GDP), Gross fixed capital formation (% of GDP), Real Exchange rates, Mineral Rents (% of GDP), Political Stability, Capital Account Openness.
- We also apply the FGLS technique after, estimating FE estimations and identifying cross-sectional dependence and serial correlation in the panels.

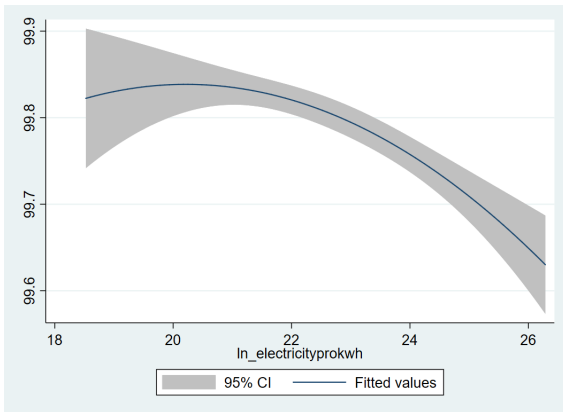
# Descriptive - MVApc & Electricity



# Descriptive - MHTech Exp & Electricity



# Descriptive - Low Tech Exp & Electricity



# Medium and High Tech Exports & Electricity

| VARIABLES                                      | (1)<br>GLS                | (2)<br>GLS                 | (3)<br>GLS             | (4)<br>GLS              |
|--|---------------------------|----------------------------|------------------------|-------------------------|
| <i>MHXSH<sub>it</sub></i>                      | 0.000713***<br>(4.45e-05) | 0.00335***<br>(0.000568)   | -0.263***<br>(0.0911)  | -0.0356<br>(0.0303)     |
| <i>ELECT<sub>it</sub></i>                      | 0.0777***<br>(0.00152)    | 0.0753***<br>(0.00169)     | -0.267***<br>(0.101)   | -0.0620*<br>(0.0359)    |
| <i>MHXSH<sub>it</sub> * ELECT<sub>it</sub></i> |                           | -0.000116***<br>(2.52e-05) | 0.0117***<br>(0.00411) | 0.00145<br>(0.00134)    |
| <i>GROWTH<sub>it</sub></i>                     | 0.180***<br>(0.00252)     | 0.178***<br>(0.00316)      | 0.453***<br>(0.0837)   | 0.276***<br>(0.0486)    |
| <i>GFCF<sub>it</sub></i>                       | 0.000963***<br>(8.68e-05) | 0.000984***<br>(8.35e-05)  | 0.0128**<br>(0.00512)  | 0.00218<br>(0.00418)    |
| <i>HCI<sub>it</sub></i>                        | 1.469***<br>(0.00688)     | 1.462***<br>(0.0120)       | -0.724***<br>(0.159)   | 1.593***<br>(0.0884)    |
| <i>PSC<sub>it</sub></i>                        | 0.00367***<br>(4.83e-05)  | 0.00382***<br>(6.07e-05)   | -0.0156**<br>(0.00608) | 0.00458***<br>(0.00140) |
| <i>RER<sub>it</sub></i>                        | -0.00664<br>(0.00602)     | 0.00125<br>(0.00651)       | 0.0263<br>(0.104)      | -0.118<br>(0.235)       |
| <i>Mineralrents<sub>it</sub></i>               | -0.00218***<br>(0.000307) | -0.00207***<br>(0.000338)  | -0.0366**<br>(0.0184)  | -0.00838*<br>(0.00472)  |
| <i>Political<sub>it</sub></i>                  | 0.00724***<br>(0.000733)  | 0.00755***<br>(0.000813)   | 0.0922***<br>(0.0207)  | -0.00531<br>(0.0201)    |
| <i>Capopen<sub>it</sub></i>                    | -0.0419***<br>(0.00231)   | -0.0459***<br>(0.00376)    | -0.0399<br>(0.608)     | -0.225**<br>(0.0896)    |
| Constant                                       | -3.634***<br>(0.0413)     | -3.530***<br>(0.0856)      | 1.178<br>(3.155)       | -2.944**<br>(1.234)     |
| Observations                                   | 594                       | 594                        | 135                    | 216                     |
| Number of id                                   | 22                        | 22                         | 5                      | 8                       |
| Dependent Variable                             | MVApc                     | MVApc                      | MVApc                  | MVApc                   |
| Fixed Effects                                  | Yes                       | Yes                        | Yes                    | Yes                     |
| Region   |                           |                            | West Africa            | Southern Africa         |

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

# Low Tech Exports & Electricity

| VARIABLES                                      | (1)<br>GLS                | (2)<br>GLS                | (3)<br>GLS              | (4)<br>GLS              |
|--|---------------------------|---------------------------|-------------------------|-------------------------|
| <i>LTXSH<sub>it</sub></i>                      | -0.0727***<br>(0.00590)   | -0.0362***<br>(0.000440)  | 0.0350***<br>(0.00657)  | -0.0387***<br>(0.00953) |
| <i>ELECT<sub>it</sub></i>                      | 0.0756***<br>(0.00162)    | 0.182***<br>(0.0193)      | -0.582<br>(0.464)       | -1.338<br>(1.013)       |
| <i>LTXSH<sub>it</sub> * ELECT<sub>it</sub></i> |                           | -0.00106***<br>(0.000194) | 0.00654<br>(0.00468)    | 0.0130<br>(0.0102)      |
| <i>GROWTH<sub>it</sub></i>                     | 0.176***<br>(0.00308)     | 0.180***<br>(0.00264)     | 0.0323<br>(0.0489)      | 0.293***<br>(0.0464)    |
| <i>GFCF<sub>it</sub></i>                       | 0.00103***<br>(7.93e-05)  | 0.000871***<br>(8.92e-05) | -0.0183***<br>(0.00312) | 0.00283<br>(0.00414)    |
| <i>HCI<sub>it</sub></i>                        | 1.461***<br>(0.0110)      | 1.476***<br>(0.00687)     | -0.620***<br>(0.125)    | 1.599***<br>(0.0882)    |
| <i>PSC<sub>it</sub></i>                        | 0.00367***<br>(5.74e-05)  | 0.00376***<br>(4.98e-05)  | 0.0188***<br>(0.00601)  | 0.00496***<br>(0.00136) |
| <i>RER<sub>it</sub></i>                        | -0.00112<br>(0.00632)     | -0.00387<br>(0.00614)     | 0.0351<br>(0.0968)      | -0.149<br>(0.234)       |
| <i>Mineralrents<sub>it</sub></i>               | -0.00198***<br>(0.000323) | -0.00206***<br>(0.000314) | -0.0184<br>(0.0166)     | -0.00936**<br>(0.00465) |
| <i>Political<sub>it</sub></i>                  | 0.00756***<br>(0.000771)  | 0.00764***<br>(0.000764)  | 0.0287<br>(0.0211)      | -0.00649<br>(0.0200)    |
| <i>Capopen<sub>it</sub></i>                    | -0.0436***<br>(0.00357)   | -0.0433***<br>(0.00241)   | -0.475**<br>(0.222)     | -0.227**<br>(0.0896)    |
|  | (0.00515)                 | (0.00280)                 | (0.0859)                | (0.0614)                |
| Constant                                       | 3.770***<br>(0.618)       | 0<br>(0)                  | 0<br>(0)                | 0<br>(0)                |
| Observations                                   | 594                       | 594                       | 135                     | 216                     |
| Number of id                                   | 22                        | 22                        | 5                       | 8                       |
| Dependent Variable                             | MVApc                     | MVApc                     | MVApc                   | MVApc                   |
| Fixed Effects                                  | Yes                       | Yes                       | Yes                     | Yes                     |
| Region   |                           |                           | West Africa             | Southern Africa         |

Standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1



## Summary of Key Results

- Generally, the evidence shows that medium and high tech exports and electricity production are important for industrial development and growth.
- The net influence of medium and high tech exports and electricity on MVA per capita is statistically significant and positive for the African countries in the sample.
- In other words, if electricity supply worsens and tech exports reduce, industrial development will slow down, and vice versa.

## Summary of Key Results. . .

- In the case of the Southern African region, electricity production has an influence on MVA per capita, implying that lower electricity supplied affects industrial development. In addition, we do not find any significant influence from Medium and High tech exports for Southern Africa in our sample.
- Low Tech exports have a negative influence on industrial development in Southern African countries in the sample.
- However, gross fixed capital formation, mineral rents, capital account openness, private sector credit and population growth all have a significant influence on industrial development in the Southern African countries in the sample. This is seen in estimations for both categories of tech exports.
- The FGLS estimates are similar to the FE results, but control for correlation in the cross-sections.

## Policy Implications

- Technology exports improve productivity in the manufacturing sector generally. However, this cannot happen if there are power supply challenges. Where such challenges persist, industrial output will be affected adversely.
- For policy, the power should not off for industries at all.
- Low technology exports are not the way to go. Instead medium and high tech exports, coupled with stable power supply, are a sure pathway to industrial development and growth.
- Structural transformation supporting trade and financial liberalization in African countries and especially in the Southern African region. This needs to be balanced with the priorities of domestic industrial policy.
- Public Private partnerships could work, especially in Southern Africa, where the share of private sector credit in GDP is high. However, the role of the state is critical to the success of this approach.

## Policy Implications. . .

- Industrial Policy in Southern Africa must therefore focus on structural transformation that is centered on industry/manufacturing.
- Industrial Policy can also be used to create special power agreements for the manufacturing sector. These can be implemented in industrial parks, hubs or special economic zones.
- Industrial policy cannot be overshadowed by the political economy issues within the power sector. These issues contribute to decisions on who pays more or less for power.
- Industrial policy can also consider redirecting the effects of labour-saving technology used in producing high tech exports, towards medium technology activities that can sustain the momentum towards industrial development

# Thank You!

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