MAPPING THE CONTOURS OF THE EMERGING DIGITAL KNOWLEDGE ECONOMY IN SUB-SAHARAN AFRICA

Sanna Ojanperä

Researcher and Doctoral Student
Oxford Internet Institute & The Alan Turing Institute

Digital | Economy | Africa Conference
March 27-28, 2019
The School of Tourism and Hospitality, University of Johannesburg


SHARED MODE
ACCESS POINT

Measuring the Digital Economy

GDP = growth

Measuring the Digital Economy

GDP = growth

≈ welfare?

Measuring the Digital Economy

GDP = growth

≈ welfare?

≈ productivity?

Measuring the Digital Economy

GDP = growth

≈ welfare?

≈ productivity?

Official statistics?

Measuring the Digital Economy

GDP = growth

≈ welfare?

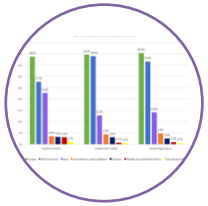
≈ productivity?

Official statistics?

Big data?

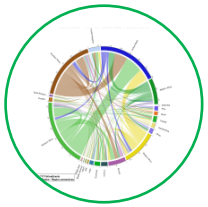
Four Perspectives Into the Digital Knowledge Economy in SSA

Friederici, N., Ojanperä, S., & Graham, M. (2017). The Impact of Connectivity in Africa: Grand Visions and The Mirage of Inclusive Digital Development. *Electronic Journal of Information Systems in Developing Countries*, *79*(2), 1–20.



Ojanperä, S., Graham, M., Straumann, R. K., De Sabbata, S., & Zook, M. (2017). Engagement in the knowledge economy: Regional patterns of content creation with a focus on sub-Saharan Africa. *Information Technologies & International Development*, 13, 33–51.

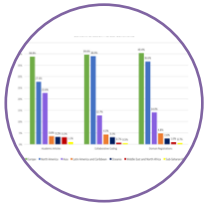
Ojanperä, S., Graham, M., and Zook, M. (2019) The Digital Knowledge Economy Index: Mapping Content Production. *The Journal of Development Studies,* DOI: 10.1080/00220388.2018.1554208



Ojanperä, S., Graham, M., and Braesemann, F. (2019) *The Networked Nature of the Sub-Saharan African Knowledge Economy.* Article manuscript in preparation.

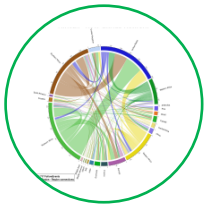
Four Perspectives Into the Digital Knowledge Economy in SSA

Friederici, N., Ojanperä, S., & Graham, M. (2017). The Impact of Connectivity in Africa: Grand Visions and The Mirage of Inclusive Digital Development. *Electronic Journal of Information Systems in Developing Countries*, *79*(2), 1–20.

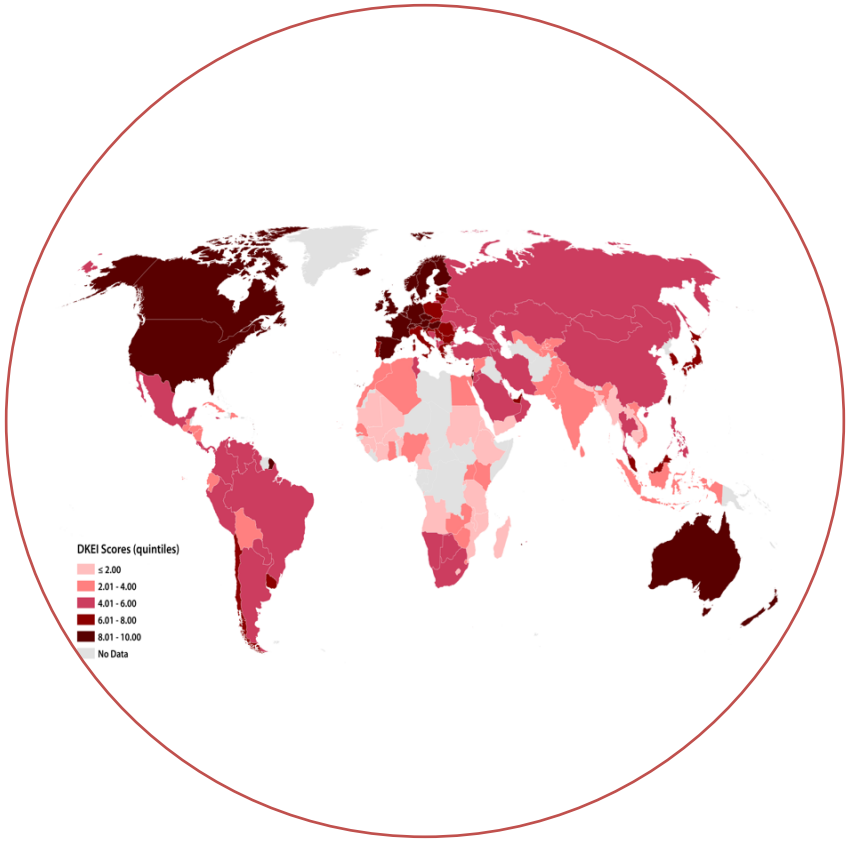


Ojanperä, S., Graham, M., Straumann, R. K., De Sabbata, S., & Zook, M. (2017). Engagement in the knowledge economy: Regional patterns of content creation with a focus on sub-Saharan Africa. *Information Technologies & International Development*, 13, 33–51.

Ojanperä, S., Graham, M., and Zook, M. (2019) The Digital Knowledge Economy Index: Mapping Content Production. *The Journal of Development Studies,* DOI: 10.1080/00220388.2018.1554208

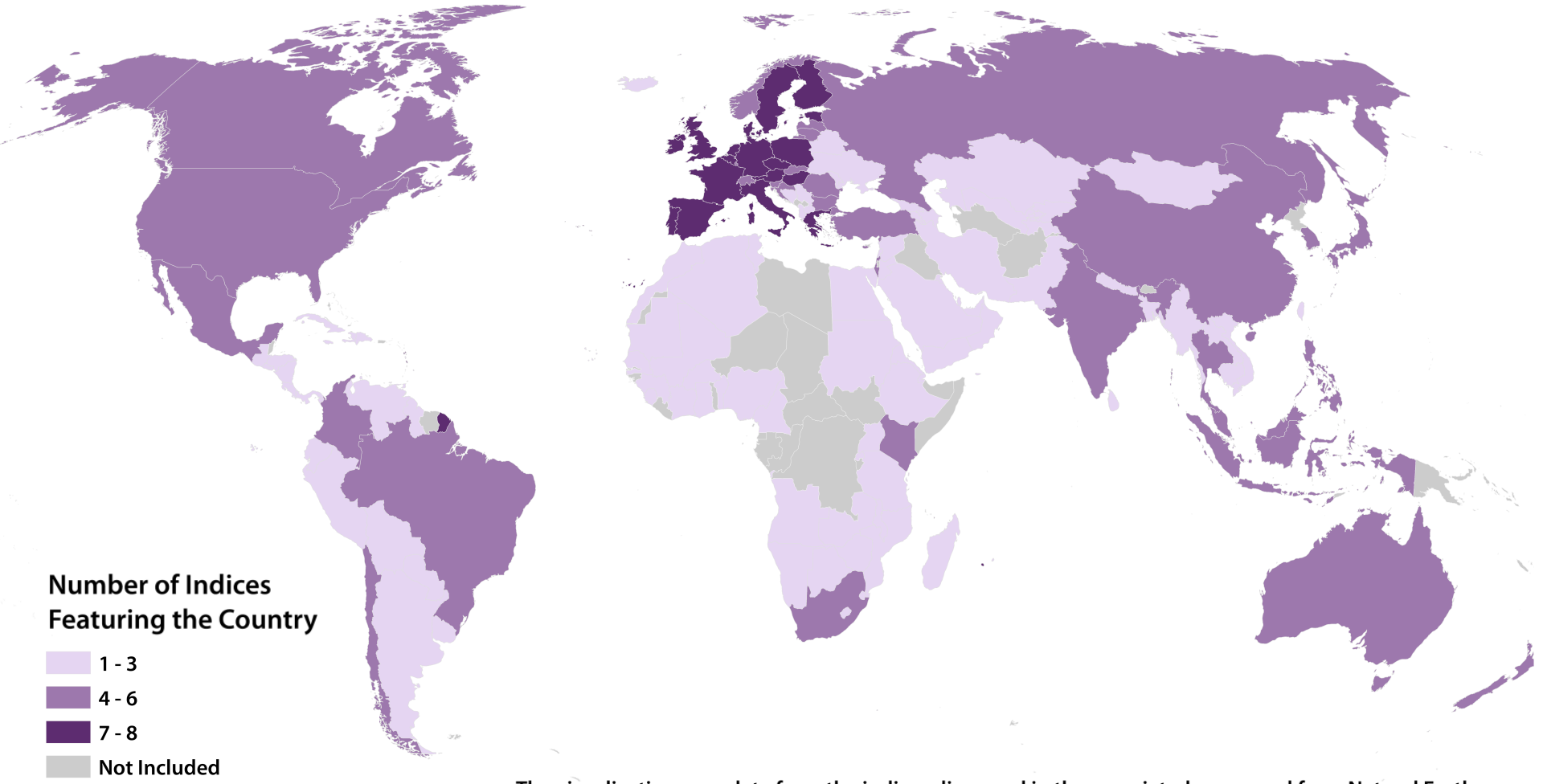


Ojanperä, S., Graham, M., and Braesemann, F. (2019) *The Networked Nature of the Sub-Saharan African Knowledge Economy.* Article manuscript in preparation.



The Digital Knowledge Economy Index

Geographical Coverage of Knowledge Economy Indices



The visualization uses data from the indices discussed in the associated paper and from Natural Earth.

Need for a Reflexive Inquiry

- Indices are often intended to work as easy-to-use interactive tools

Need for a Reflexive Inquiry

- Indices are often intended to work as easy-to-use interactive tools
- They tend to state general limitations, but often don't encourage deeper reflection about measurement choices

Need for a Reflexive Inquiry

- Indices are often intended to work as easy-to-use interactive tools
- They tend to state general limitations, but often don't encourage deeper reflection about measurement choices
- Index methodology and normalization procedures often presented matter-of-factly

Lacking Measures on Digital Participation

- Indices focus exclusively on traditional data sources

Lacking Measures on Digital Participation

- Indices focus exclusively on traditional data sources
- Africa's 'statistical tragedy' makes data quality questionable

Lacking Measures on Digital Participation

- Indices focus exclusively on traditional data sources
- Africa's 'statistical tragedy' makes data quality questionable
- Given the centrality of technology and human capital in the knowledge economy, its measurement should feature an estimation of knowledge-rich digital activity

Creating the Digital Knowledge Economy Index (DKEI)

- Inclusion of variables measuring digital participation and knowledge creation

Creating the Digital Knowledge Economy Index (DKEI)

- Inclusion of variables measuring digital participation and knowledge creation
- Emphasis on data selection and measurement choices

Creating the Digital Knowledge Economy Index (DKEI)

- Inclusion of variables measuring digital participation and knowledge creation
- Emphasis on data selection and measurement choices
- Building on the World Bank Knowledge Economy Index (KEI) data and estimation methodology

Data on Digital Participation

- Fifth sub-index on digital participation and content creation to consider alongside the existing sub-indices on **education, innovation, economic institutional regime, and ICTs**
- Includes variables on:
  - Collaborative coding
  - Wikipedia editing activity
  - Domain registrations

Collaborative Coding

- GitHub code-sharing platform

Collaborative Coding

- GitHub code-sharing platform
- Commits – instances of content contribution

Collaborative Coding

- GitHub code-sharing platform
- Commits – instances of content contribution
- Approximate programming skills

Collaborative Coding

- GitHub code-sharing platform
- Commits – instances of content contribution
- Approximate programming skills
- Limitations:
  - 25% of users (45% of commits) indicate location

Collaborative Coding

- GitHub code-sharing platform
- Commits – instances of content contribution
- Approximate programming skills
- Limitations:
  - 25% of users (45% of commits) indicate location
  - Geocoding margin of error

Wikipedia Editing Activity

- Collaborative encyclopedia project

Wikipedia Editing Activity

- Collaborative encyclopedia project
- Edits published from within a country

Wikipedia Editing Activity

- Collaborative encyclopedia project
- Edits published from within a country
- Approximate the capacity to expand and improve knowledge contained in this open resource

Wikipedia Editing Activity

- Collaborative encyclopedia project
- Edits published from within a country
- Approximate the capacity to expand and improve knowledge contained in this open resource
- Limitations:
  - False or debatable information or vandalism

Wikipedia Editing Activity

- Collaborative encyclopedia project
- Edits published from within a country
- Approximate the capacity to expand and improve knowledge contained in this open resource
- Limitations:
  - False or debatable information or vandalism
  - No metrics on the quality or appropriateness of edits

Domain Registrations

- Top-level domains related to a country

Domain Registrations

- Top-level domains related to a country
- ccTLDs, gTLDs, and IDNccTLDs

Domain Registrations

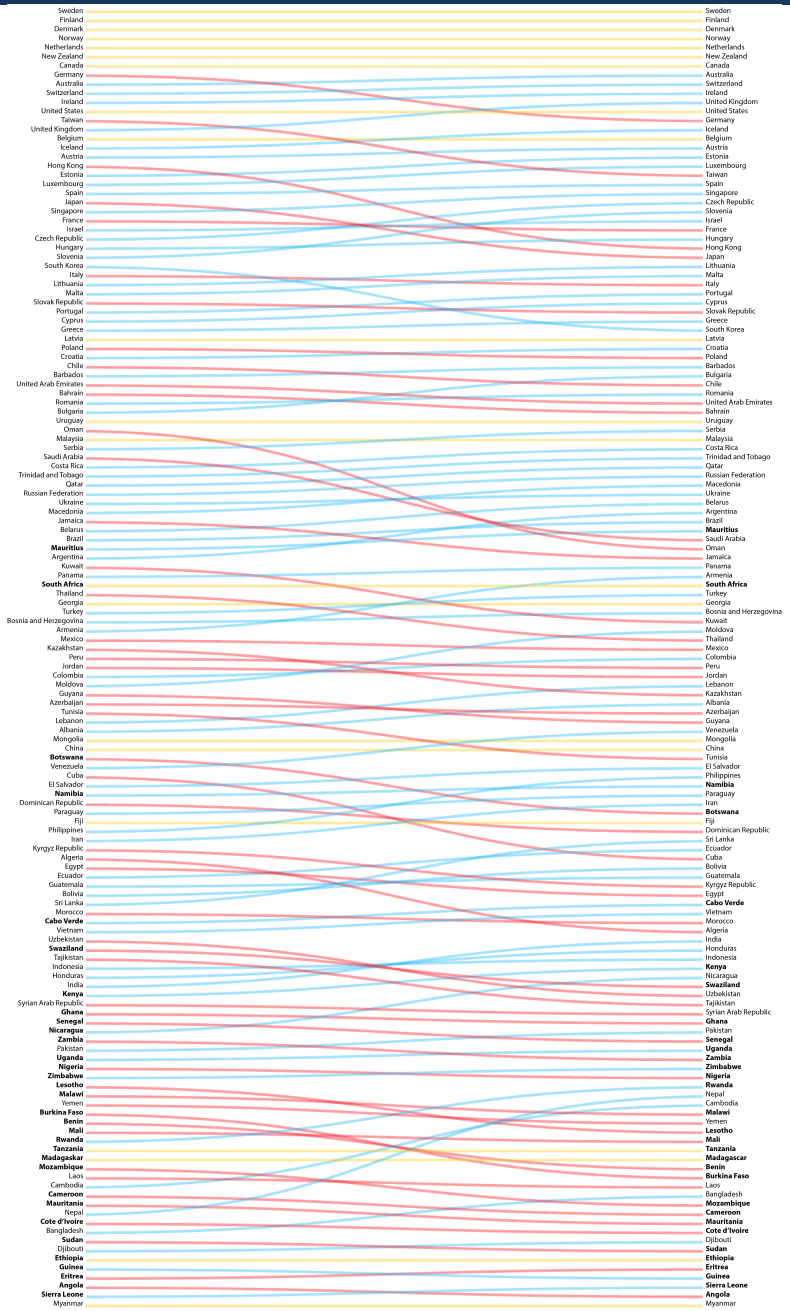
- Top-level domains related to a country
- ccTLDs, gTLDs, and IDNccTLDs
- Approximate the volume of codified information and knowledge that is accessible online

Domain Registrations

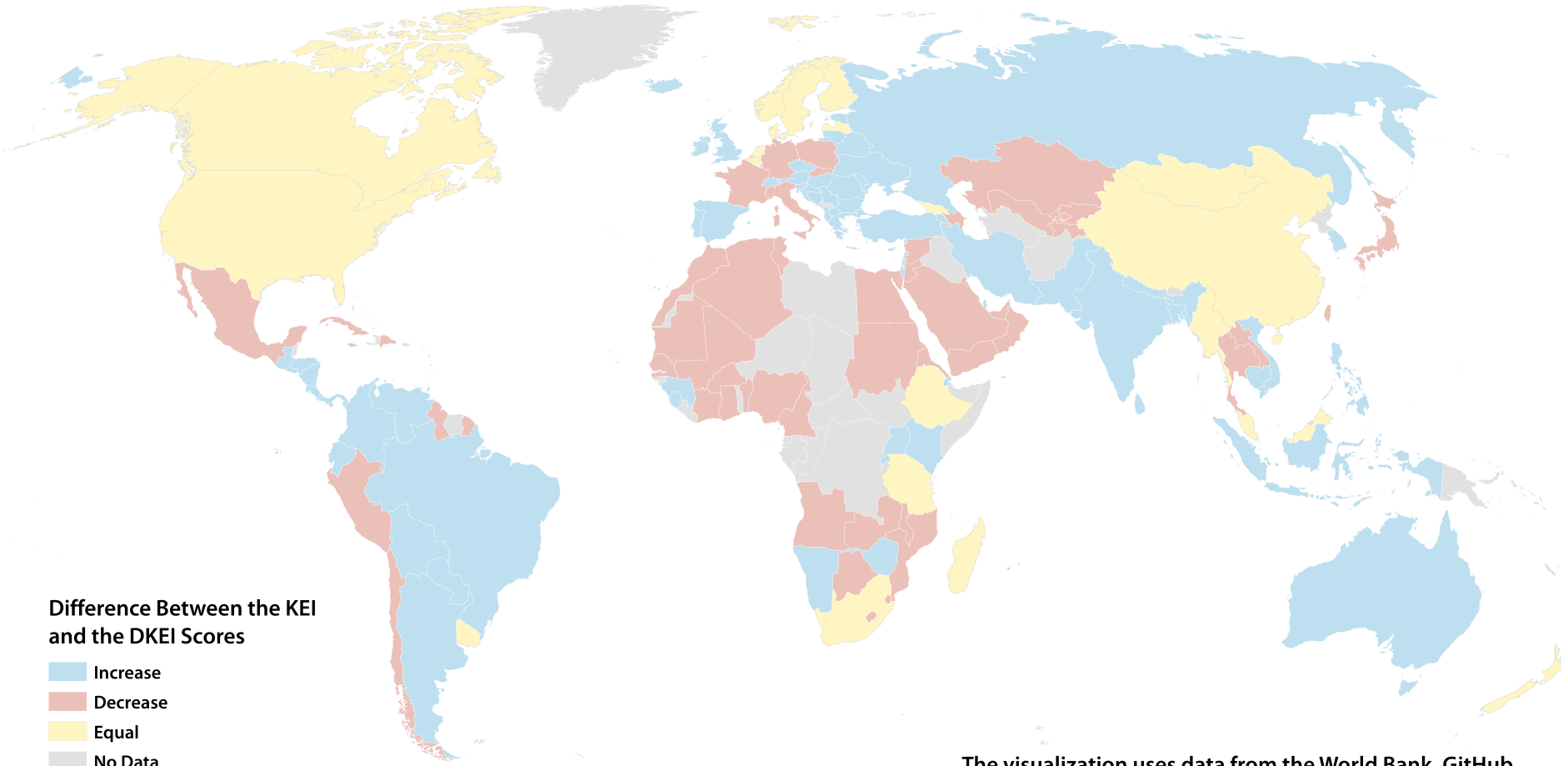
- Top-level domains related to a country
- ccTLDs, gTLDs, and IDNccTLDs
- Approximate the volume of codified information and knowledge that is accessible online
- Limitations:
  - TLD "hacks" eliminated

Difference Between the KEI and the DKEI Scores

- Increase
- Decrease
- Equal
- No Data



Shift in the Measurement of the Knowledge Economy



The visualization uses data from the World Bank, GitHub, Wikipedia, domain registrations and from Natural Earth.

Conclusions

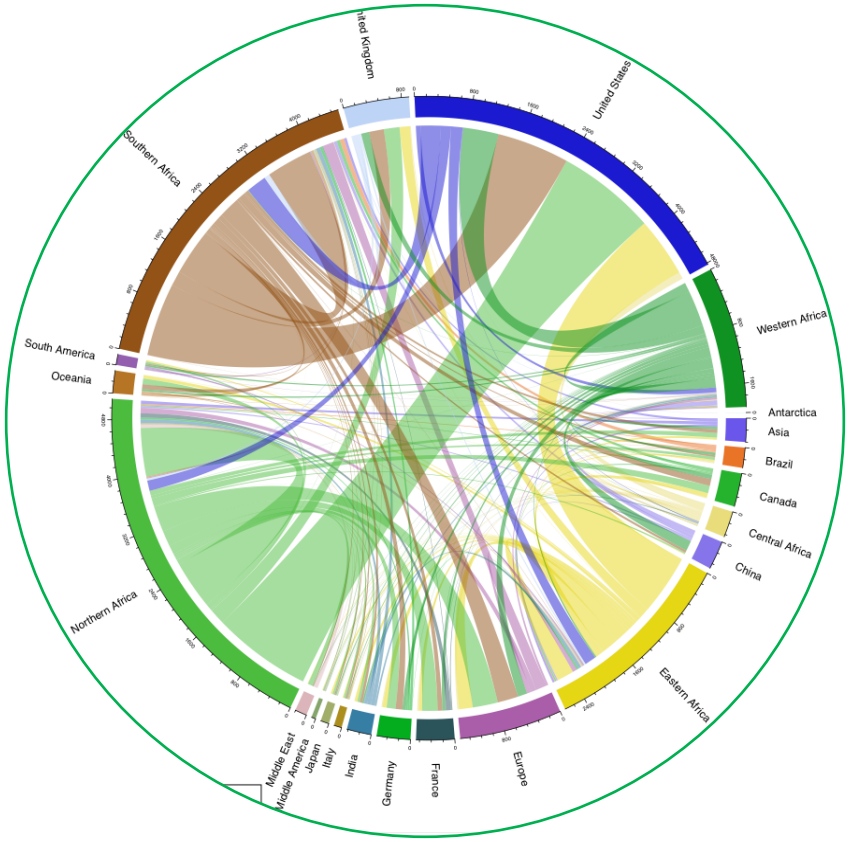
Including digital participation in the estimation of knowledge economy seems to indicate challenges rather than prospects in Sub-Saharan Africa.

Conclusions

Heuristic devices such as indices should be accompanied with more reflection about measurement choices.

Conclusions

Digital data has its own limitations, but offers a valuable proxy to measure key characteristics of the knowledge economy.



Networks of Collaborative Coding

RQ: Do Sub-Saharan African programmers collaborate with others in the region, resembling the flows of traditionally manufacture-led intra-regional trade or with users outside the continent resembling the primary-commodity-led export flows?

Data and Methods

- Measuring collaborative coding as a knowledge-rich activity:
  - GitHub code-hosting platform

Data and Methods

- Measuring collaborative coding as a knowledge-rich activity:
  - GitHub code-hosting platform
  - 'Follow events' between users

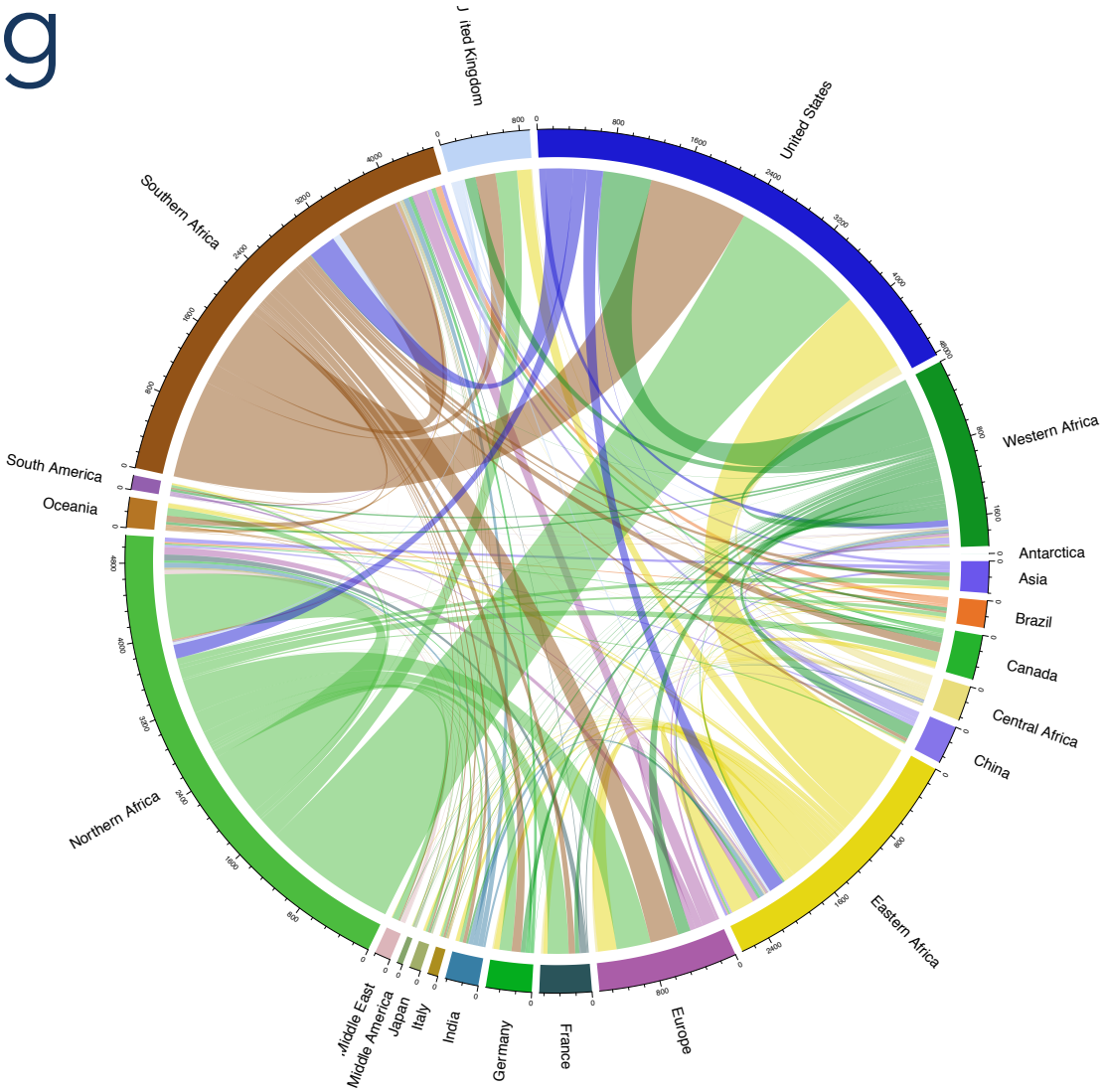
Data and Methods

- Measuring collaborative coding as a knowledge-rich activity:
  - GitHub code-hosting platform
  - 'Follow events' between users
    - Popular with tech entrepreneurs and in the start-up scene

Data and Methods

- Measuring collaborative coding as a knowledge-rich activity:
  - GitHub code-hosting platform
  - 'Follow events' between users
    - Popular with tech entrepreneurs and in the start-up scene
    - Measures the knowledge transfer between users, and how globally 'connected' African programmers are

SSA Network of Collaborative Coding



Conclusions

Sub-Saharan African programmers contribute a small volume of collaborative programming on GitHub.

Conclusions

African programmers look for influence outside the continent, and do not have a strong network within the region apart from sub-regional clusters.


SHARED MODE
ACCESS POINT

Measuring the Digital Knowledge Economy

- Complex constellation of entities and activities challenging to reflect in a single measurement

Measuring the Digital Knowledge Economy

- Complex constellation of entities and activities challenging to reflect in a single measurement
- Helpful to investigate a specific segment of the digital knowledge economy

Measuring the Digital Knowledge Economy

- Complex constellation of entities and activities challenging to reflect in a single measurement
- Helpful to investigate a specific segment of the digital knowledge economy
- Including measures of digitally-enabled content creation allows investigating areas of the economy excluded from national statistics

THANK YOU!

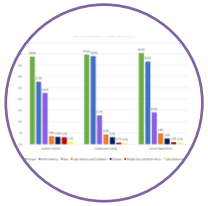
Sanna Ojanperä
E sanna.ojanpera@oii.ox.ac.uk
T @SannaOjanpera
W geonet.oii.ox.ac.uk
www.oii.ox.ac.uk/people/sanna

Data science, artificial intelligence and the futures of work

Sanna Ojanperä, Neave O'Clery, and Mark Graham

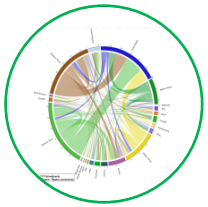
Four Perspectives Into the Digital Knowledge Economy in SSA

Friederici, N., Ojanperä, S., & Graham, M. (2017). The Impact of Connectivity in Africa: Grand Visions and The Mirage of Inclusive Digital Development. *Electronic Journal of Information Systems in Developing Countries*, *79*(2), 1–20.



Ojanperä, S., Graham, M., Straumann, R. K., De Sabbata, S., & Zook, M. (2017). Engagement in the knowledge economy: Regional patterns of content creation with a focus on sub-Saharan Africa. *Information Technologies & International Development*, 13, 33–51.

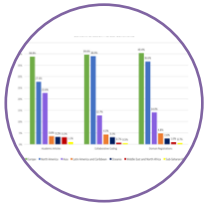
Ojanperä, S., Graham, M., and Zook, M. (2019) The Digital Knowledge Economy Index: Mapping Content Production. *The Journal of Development Studies,* DOI: 10.1080/00220388.2018.1554208



Ojanperä, S., Graham, M., and Braesemann, F. (2019) *The Networked Nature of the Sub-Saharan African Knowledge Economy.* Article manuscript in preparation.

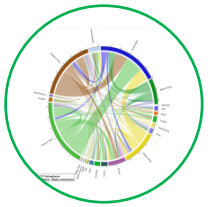
Four Perspectives Into the Digital Knowledge Economy in SSA

Friederici, N., Ojanperä, S., & Graham, M. (2017). The Impact of Connectivity in Africa: Grand Visions and The Mirage of Inclusive Digital Development. *Electronic Journal of Information Systems in Developing Countries*, *79*(2), 1–20.



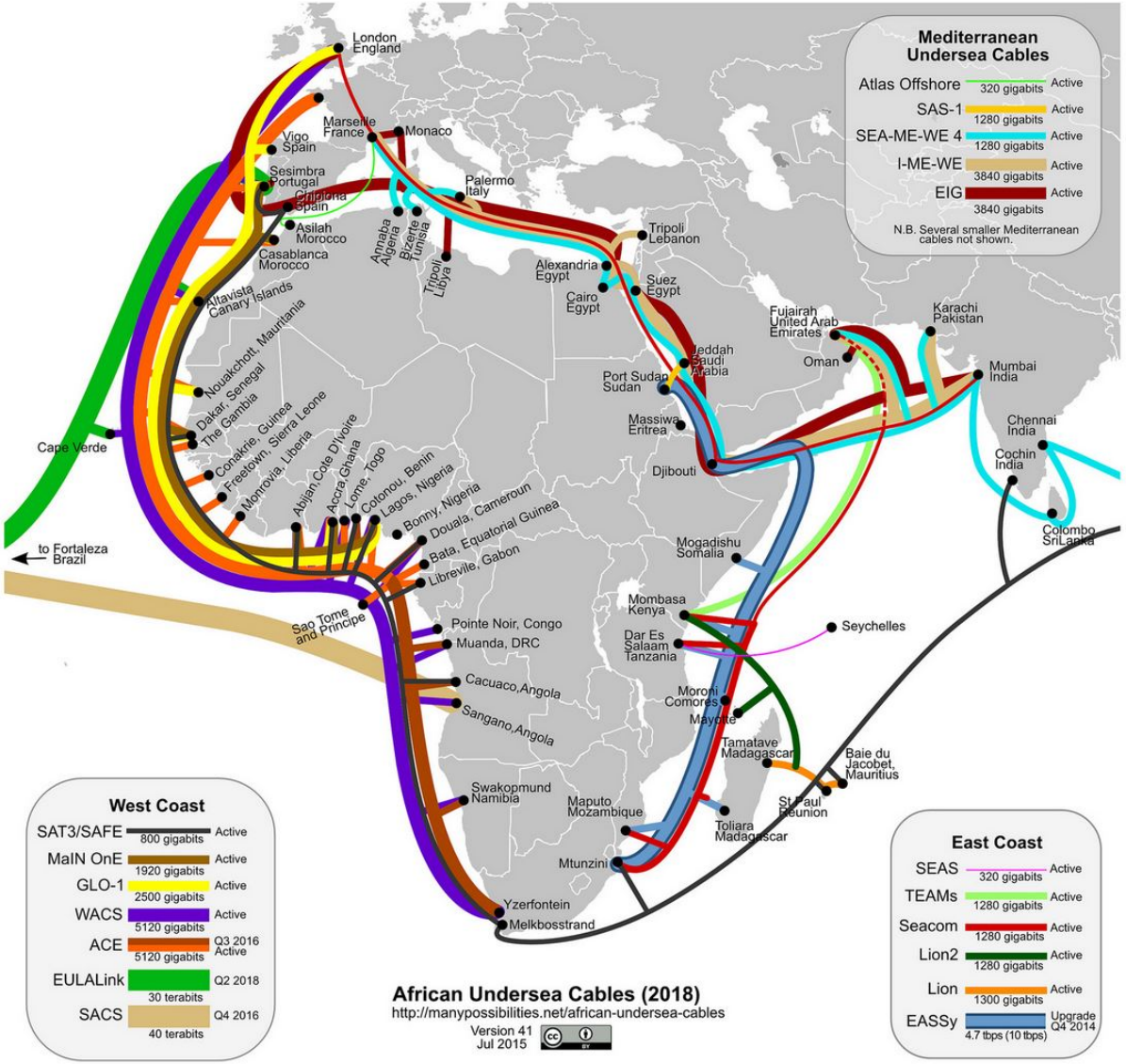
Ojanperä, S., Graham, M., Straumann, R. K., De Sabbata, S., & Zook, M. (2017). Engagement in the knowledge economy: Regional patterns of content creation with a focus on sub-Saharan Africa. *Information Technologies & International Development*, 13, 33–51.

Ojanperä, S., Graham, M., and Zook, M. (2019) The Digital Knowledge Economy Index: Mapping Content Production. *The Journal of Development Studies,* DOI: 10.1080/00220388.2018.1554208

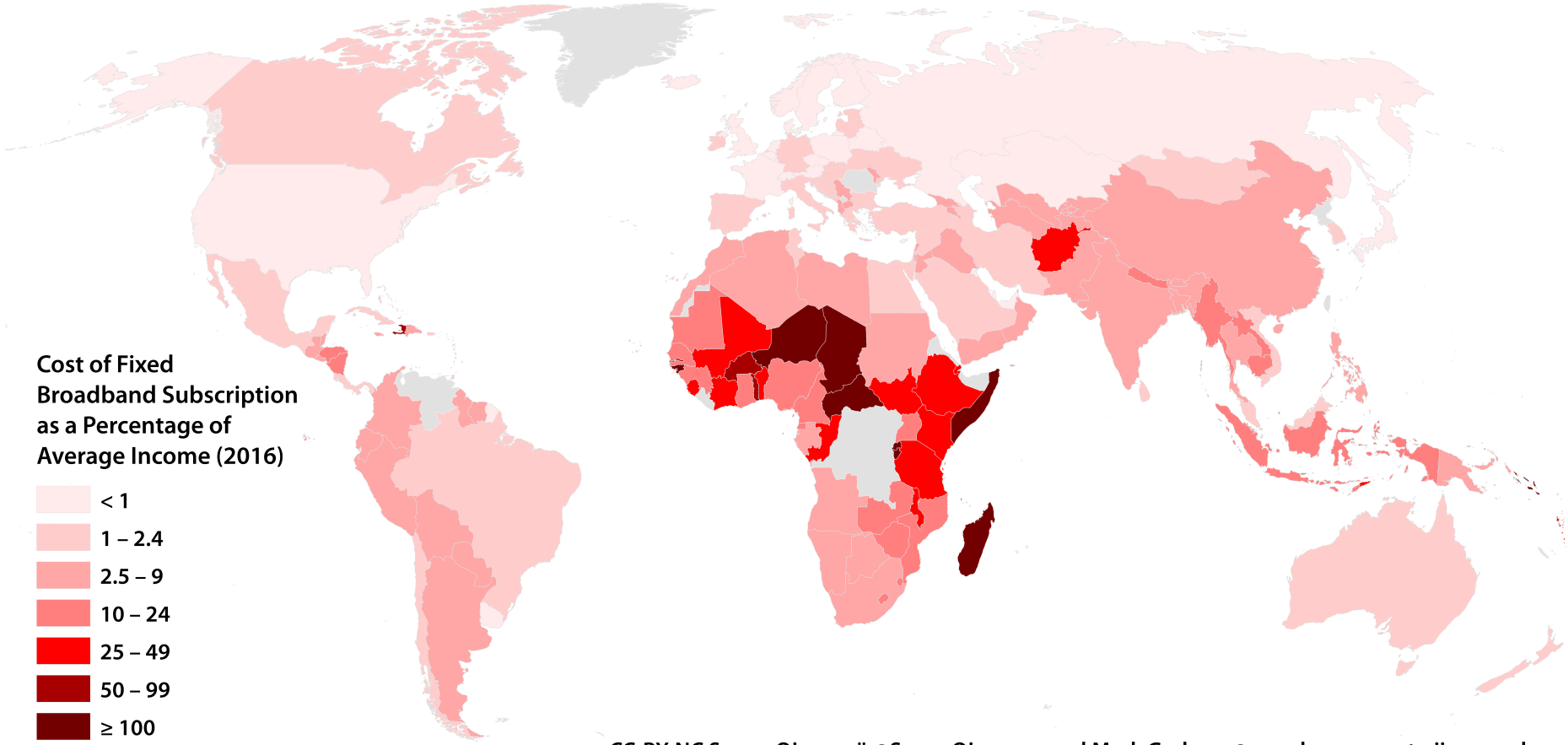


Ojanperä, S., Graham, M., and Braesemann, F. (2019) *The Networked Nature of the Sub-Saharan African Knowledge Economy.* Article manuscript in preparation.

Connectivity in Sub-Saharan Africa



Broadband Affordability (2016)



The visualization uses data from the ITU ICT Prices 2017 Report and from Natural Earth.