Sebastian Krantz

Junior Researcher in the Africa Initiative at Kiel Institute for the World Economy

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Core Competencies

- Economic Research and Analysis in both Academic and Policy Contexts

- Strong Skills in Econometrics, Time Series, and Machine Learning, and Practical Experience with DSGE, CGE, and Quantitative Spatial Models

- High-Performance Statistical Software Engineering and Full-Stack Web-Application and API Development

- 2 Years of Experience in Macroeconomic Policy Making in African Economies

Education

PhD in Quantitative Economics, Magna cum Laude, Kiel University (Kiel Institute).   2021–2024
Dissertation: Africa's Economic Transformation: A Big Data Perspective (Keywords: Optimal Infrastructure Investments, Regional Integration, Macroeconomic Stabilization)
Supervisor: Prof. Tobias Heidland, *Second Reader:* Prof. Christoph Trebesch.

Master in International Economics (MIE), Geneva Graduate Institute (IHEID).   2017–2019
Focus: Macroeconomics, Development, Econometrics, Trade. **GPA**: 5.54 of 6
Dissertation: Endogenous R&D and Technology Diffusion in a Multi-Sector RBC Economy (Keywords: DSGE, Endogenous Growth, Business Cycles, Sectoral Shocks)
Supervisor: Prof. Cédric Tille, *Second Reader*: Prof. Rahul Mukherjee.

BA. Liberal Arts and Science, Magna cum Laude, University College   2014–2017
Roosevelt (UCR) - Liberal Arts & Sciences Honors College of Utrecht University.

Major: Economics and Social Science (Economics, Anthropology, IR, Law, History)
Minor 1: Mathematics, **Minor 2**: Statistics. **GPA**: 3.87 of 4

Honors Thesis: The Interdependence of Economic Growth, Human Development, and Political Institutions: A General Equilibrium Framework

Employment

Junior Researcher in the Kiel Institute Africa Initiative   2021–2024

The Kiel Institute for the World Economy (IfW) is a leading research institute on global economic affairs. I am a junior researcher in the Research Center International Development and the Africa Initiative.

Research
Papers on macroeconomic stabilization, regional integration (both published), and economic returns to infrastructure/spatially optimal infrastructure investments in Africa. My first infrastructure paper builds the Africa Infrastructure Database – the largest open granular database of identified infrastructure assets, businesses, and economic geography in Africa – and uses causal ML to map local economic returns to incremental investments in 14 types of infrastructure (semi-elasticities and counterfactual predictions) at 9.7km resolution. The second paper characterizes economically optimal investments into Africa's road network in partial and general equilibrium – via quantitative spatial modelling on a realistic topography of the continental network incl. road construction costs, cross-border frictions, and economic geography.

Other Outputs
Developed Africa Monitor – a modern macroeconomic information platform for Africa with R and Python APIs; a macroeconomic database and nowcasting platform for South Africa, consulted GIZ/MoF Benin and the World Bank Africa Chief Economist's Office, and engaged in extensive software engineering.

Senior Economist (ODI Fellow) in the Macroeconomic Policy Department, Ministry of Finance, Planning and Economic Development, Uganda.   2020-2021

Analytics & Research
Macroeconometric analysis of planned increase in excise duties on petrol and diesel. Econometric estimation of elasticity parameters for a CGE model to evaluate social policies. Development of a GDP nowcast. COVID-19 tourism sector emergency response paper and strategy paper investigating the potential of cultural tourism development. Worked with World Bank team to update adjusted macroeconomic indicators for Uganda and developed a model to forecast them. Developed model to perform disaggregated annual revenue forecasting by tax head + short-term (monthly, quarterly) models. Started work to revise the department's main financial programming model. Research papers on the effects of fiscal spending (SVAR + fiscal multiplier analysis) and GVCs and RVCs in the EAC.

IT and Process Innovation
Automated scraping of >10,000 macroeconomic indicators from national sources + codes for >3000 national indicators. Developed UGATSDB: a mixed frequency time series database with monthly updates. Developed open access online data portal and R API package for easy data retrieval. The database facilitates analysis and powers a macroeconomic dashboard that displays the GDP nowcast and leading economic indicators. Automated the department's monthly economic performance report using computable documents linking to UGATSDB. Built a modern department website integrating these services and making accessible all public (present and historical) department reports.

Teaching and Capacity Building
Structured R-based Data Science Training Programme consisting of 6 delivered 2-day intensive courses taught in monthly intervals. Followed actively by 2 junior staff from the department which now maintain the website, database, apps, and computable monthly report. 4+ external staff also attended.

Publications

Working Papers

Krantz, S. (2024). Optimal Investments in Africa's Road Network. *Kiel Working Paper and World Bank Policy Research Working Paper.* https://github.com/SebKrantz/OptimalAfricanRoads.

Under Review

Krantz, S. (2024). Mapping Africa's Infrastructure Potential with Geospatial Big Data and causal ML. *Submitted to Journal of Development Economics.* https://ssrn.com/abstract=4537867.

Krantz, S. (2024). collapse: Advanced and Fast Statistical Computing and Data Transformation in R. *Journal of Statistical Software.* Revise and Resubmit. https://arxiv.org/abs/2403.05038.

Published

Krantz, S. (2024). Patterns of Global and Regional Value Chain Participation in the EAC. *Review of World Economics.* https://link.springer.com/article/10.1007/s10290-024-00558-0.

Krantz, S. (2023). Africa's Great Moderation. *Journal of African Economies*, Oxford University Press. https://doi.org/10.1093/jae/ejad021.

Krantz, S. (2017). The Interdependence of Economic Growth, Human Development and Political Institutions: A General Equilibrium Framework. *Student Undergraduate Research E-journal*, *3*.

Salam, et al. (2018). [Tanzania|Indonesia] Case Study: Rapid Technological Change - Challenges and Opportunities. *Pathways for Prosperity Comission Background Papers,* [7|8]. Oxford, UK.

Academic dissertations and unpublished working/policy papers see sebastiankrantz.com/research.

Software Engineering

I develop high-performance open-source statistical software, focusing on C/C++ based R packages (see also github.com/SebKrantz). I developed packages collapse, fastverse, dfms, osmclass, and API packages ugatsdb, africamonitor (also in Python), and samadb (also in Python and Julia). I contributed to fixest, plm, decompr, dggridR, and kit. collapse is benchmarked on windows and linux among the best-performing solutions for database-like operations (**global top 5** for laptop-grade datasets). It was downloaded **2+ million** times. An article is R&R at the Journal of Statistical Software. My latest project is OptimalTransportNetworks.jl, a Julia library to solve optimal transport networks in spatial equilibrium.

Consulting

Office of the Chief Economist, Africa Region, The World Bank (Remote)   2024

Outputs: Background paper on "Africa's Regional and Global Integration" (detailed GVC and RVC analysis, predictors of integration and economic returns) for report: "Integrating Africa Forward: From Threads to Hubs".

Ministry of Economy and Finance and GIZ Benin (Cotonou, Benin)   2023

Public Finance Reform Program to achieve the SDGs and Strengthen Revenue Mobilization.

Outputs: Delivered one-day intensive workshop on government revenue forecasting, outlining the process in Germany and presenting in detail forecasting models developed for Uganda. Attended by ~15 staff from the Ministry of Economy and Finance and the Treasury. Organized by the GIZ Benin country office in Cotonou.

Presentations

2022 – PEGNet Conference (Kampala), German Development Economics (GDE) Conference (Stuttgart), IDOS Conference (Bonn), Federal Ministry of Finance (Berlin), useR'22 (Virtual).

2023 – BBL at Stellenbosch University (Stellenbosch), Bureau for Economic Research (x2) (Stellenbosch), SEM Conference (Milan), GDE Conference (Dresden), IfW WCA Conference (Berlin), MIASA Policy Conference (Accra), Oxford Summer School (Oxford).

2024 – Global Policy Lab (Berkeley), CSAE Conference (Oxford), The World Bank (GOST - Virtual), IfW Research Seminar (Kiel), Japan International Cooperation Agency (Virtual).

Research Visits and Internships

Visiting Researcher at Stellenbosch University Economics Department   2023
Theme: Nowcasting the Economy and Measuring Inequality with Geospatial Data.

Outputs: Developed the South Africa Macroeconomic Database, and the SA Nowcast. Both were presented to a broad audience (incl. Reserve Bank, Statistics South Africa, and the Treasury). Investigated potential of geospatial data (nightlights, population, and wealth indices based on big data) to map inequality across space and time and compared estimates to Spatial Tax Panel. Presented at the department's BBL seminar.

Intern in the Chief Economists Office, Oxford Policy Management, Oxford (UK),   2018
Project: 'Rapid Technological Change: Challenges and Opportunities' - Assessing the impact of rapid technological change on the developing world.

Outputs: Conducted country-specific case studies on Indonesia and Tanzania analyzing sectoral pattern of growth, industry structure, and the innovation system based on literature, national accounts data and World Bank Enterprise Surveys. Developed a semi-automated R code to continue the analysis for further countries.

Intern in the Research Department, Bangladesh Rural Advancement Committee (BRAC), Kampala (Uganda), Project: 'Secondary Education in Uganda: New Survey Evidence' - Analyzing the quality of secondary education in Uganda.   2018

Outputs: Executed a study on secondary education: Proposal, survey design + enumerator training, data collection on 500 secondary schools cross-country, data cleaning, data analysis, write-up of findings. Developed a web application for semi-automated exploratory analysis and geo-visualization of surveys.

Computer and Language Skills

ANALYTICS & PROGRAMMING	OFFICE, DATA PRODUCTS, MEDIA	LANGUAGES
• R (Advanced + C-API)	• MS Office & Latex (Intermediate)	• German (Native)
• C/C++ (Intermediate)	• QGIS (Intermediate)	• English (Fluent)
• Python (Intermediate)	• Shiny Apps (Advanced)	• French (B1)
• SQL (Intermediate)	• Plotly Dash Apps (Beginner)	• Dutch (A2)
• STATA (Intermediate)	• Simple (HTML & CSS) Websites	• Spanish (A1)
• Julia (Intermediate)	• R Packages (Advanced)	
• Mathematica (Beginner)	• Python Packages (Beginner)	
• Matlab & Dynare (Beginner)	• Julia Packages (Beginner)	
• GEMPACK (Beginner)	• Photo: Lightroom & Photoshop	
• Linux Server + NGINX (Beginner)	• Video: IMovie & Premiere Pro	

Other Skills Trainings

BREAD-IGC Virtual PhD Course on Urban Economics. *(9 Online Lectures)*	2024
Political Economy and Development Economics, University of Oxford. *(1 Week)*	2023
Financial Programming and Policies, Revenue Forecasting, and Macroeconomic Forecasting, IMF Institute for Capacity Building via edX.	2020-2021
Practical CGE Modeling, CoPS - Victoria University. *(2 Week Online Course)*	2020
The Science and Art of DSGE Modeling, CIMS - University of Surrey. **Specialization**: Emerging Open Economies. *(5 Day Boot Camp)*	2018
Big Data in Macroeconomics and Finance, Kiel Institute for the World Economy (IfW). *(6 Day Intensive Summer School)*	2018
Studied several MOOCS/books on **Data Science, ML, and Algorithms**	2018-2023

Academic References

- **Prof. Tobias Heidland** (Director of the RC International Development at IfW and Main Supervisor)
- **Prof. Rainer Thiele** (Director of the Kiel Institute Africa Initiative at IfW)
- **Prof. Christoph Trebesch** (Director of the RC International Finance and Macroeconomics at IfW)
- **Prof. Cédric Tille** (Professor of Economics at IHEID [Teaches Macroeconomics in the MIE], Dissertation Supervisor)
- **Prof. Ugo Panizza** (Professor of Economics at IHEID [Teaches Econometrics in the MIE])
- **Dr. Hylton Hollander** (Associate Professor of Economics at UCT, Research Host in Stellenbosch)
- **Dr. Alexei Karas** (Associate Professor of Economics at UCR, Honors Thesis Supervisor)

Professional References

- **Dr. Albert Musisi** (Commissioner of the Macroeconomic Policy Department, Ministry of Finance, Planning and Economic Development of Uganda)
- **Dr. Stevan Lee** (Chief Economist at Oxford Policy Management)