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, CAU Kiel and Kiel Institute for the World Economy.　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. 2021 saw the start of research initiatives on Africa and China. I am part of the former while completing a PhD in Quantitative Economics at the University of Kiel. I have written papers on macroeconomic stabilization, regional integration, and economic returns to infrastructure/spatially optimal infrastructure investments in Africa. My first infrastructure paper introduces the Africa Infrastructure Database – the largest open granular database of identified infrastructure assets, businesses, and economic geography in Africa – and uses causal ML and explainable AI to understand the local and global significance of infrastructure(s) and map local economic returns to incremental infrastructure investments. The second characterizes optimal investments in the (continental) road network in partial and general equilibrium – using large-scale open routing data and quantitative spatial models. Apart from research, I developed the Africa Monitor: a modern macroeconomic information platform for Africa with R and Python APIs. I also

developed a macroeconomic database and nowcasting platform for South Africa, consulted GIZ in Benin and the World Bank's Africa Chief Economist 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. Paper on macroeconomic monitoring and development of a GDP nowcast. COVID-19 tourism sector emergency response paper. Strategy paper investigating the potential of cultural tourism development. Work with World Bank team to update adjusted macroeconomic indicators for Uganda and developed model to forecast them. Developed model to perform disaggregated annual revenue forecasting by tax head + short-term (monthly, quarterly) models. Started work to revise financial programming model used in the department. Research papers the effects of fiscal spending (SVAR + fiscal multiplier analysis) and GVCs and RVCs in the EAC (enhanced at Kiel Institute and published in Review of World Economics).

IT and Process Innovation
Scraped >10,000 macroeconomic indicators from national sources and IMF + World Bank, and coded >3000 national indicators. Developed UGATSDB: a mixed frequency time series database to store this data, 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 (Rmarkdown) linking to UGATSDB. Built a modern department website integrating these services and making accessible all public 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.

Research Visits and Internships

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

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

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

Tasks: Prepared country-specific case studies on Indonesia and Tanzania: Sector-level analysis of pattern of growth, industry structure and the innovation system of these countries based on literature, national accounts and World Bank Enterprise survey data. Developed a semi-automated R code to continue analysis for other countries and delivered a technical seminar on R.

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

Tasks: 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.

Consulting

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

Outputs: Background paper on "Africa's Regional and Global Integration" (detailed trade, GVC and RVC analysis) for new flagship report: "Integrating Africa Forward: From Threads to Hubs".

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

Program de Réforme des Finances publiques pour l'atteinte des ODD et le Reinforcement de la Mobilization des recettes de l'Etat (ReFORME) [Public Finance Reform Program to achieve the SDGs and Strengthen Revenue Mobilization].

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

Publications

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

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. (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

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

Salam, U., Lee, S., Fullerton, V., Yusuf, Y., Krantz, S., & Henstridge, M. (2018). [Tanzania|Indonesia] Case Study: Rapid Technological Change - Challenges and Opportunities. *Pathways for Prosperity Comission Background Papers,* [7|8]. Oxford, UK

Working papers, unpublished papers, and academic dissertations see sebastiankrantz.com/research.

Presentations

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

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).

Software Development

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

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 (Beginner)	• 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

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)